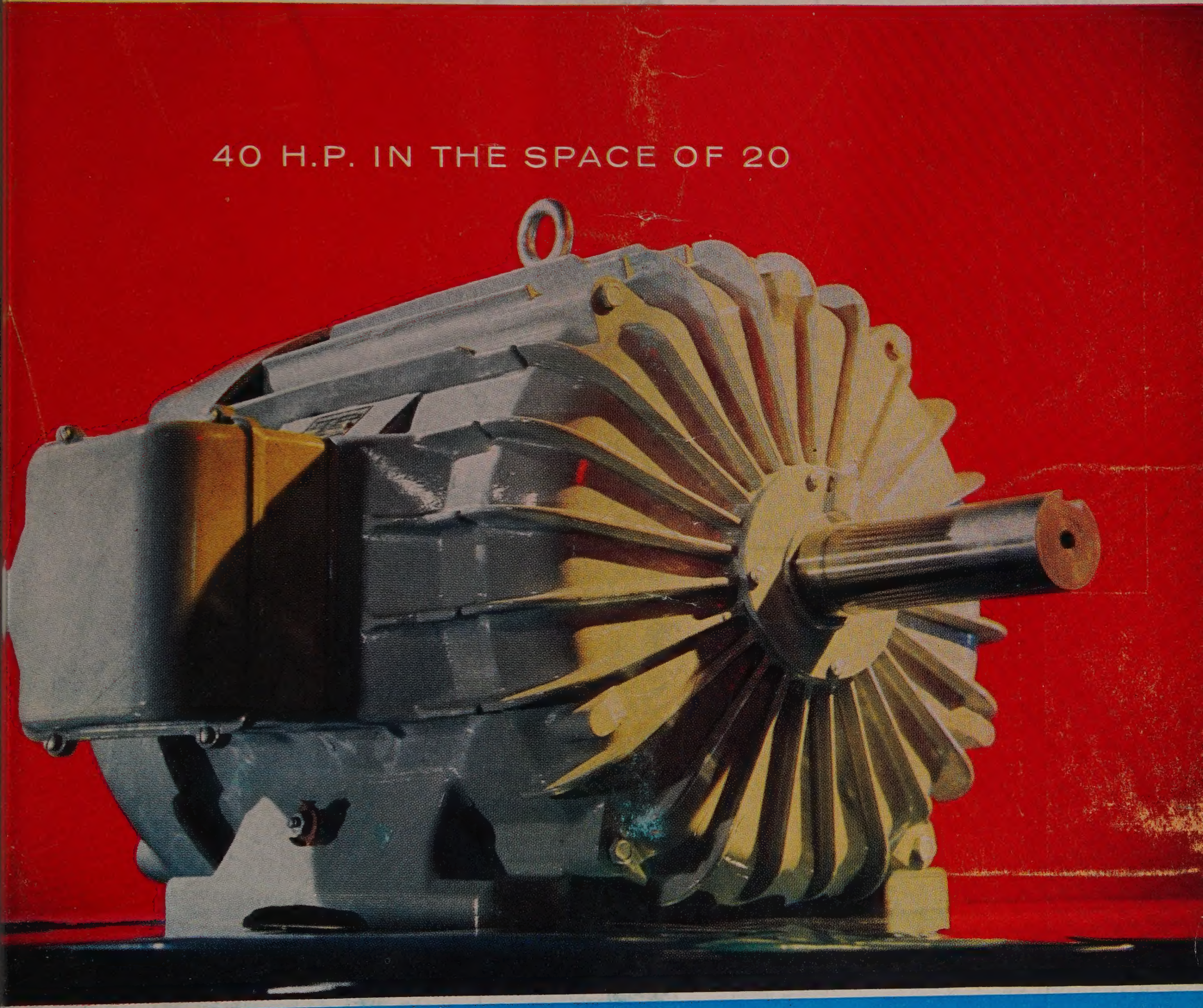
4

ELECTRICAL
REVIEW

FRIDAY
1 JULY 1960

WEEKLY
PRICE 1s 6d



Our new Series 5 T.E.F.C. motors are identical in British Standard dimensions with Series 5 ventilated motors of the same rating — and power for power down to half the size of previous T.E.F.C. motors.
Outputs from 1 to 40 h.p. at 1440 r.p.m.
Further information supplied on request.

Crompton Parkinson
LIMITED

ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LIMITED · CROMPTON HOUSE · ALDWYCH · LONDON WC2

CIRCULATION COPY 1

Stator
of a large
G.E.C.
Hydro-Alternator

THE CORE OF A FINE MACHINE

LAMINATIONS BY

RTB

LAMINATIONS of all types, in all sizes and in all grades of material.

FERROSIL hot-rolled and cold-reduced electrical sheet and strip, and hot-rolled transformer sheet.

ALPHASIL cold-reduced oriented transformer sheet and strip.

RICHARD THOMAS
& BALDWINS LTD

Enquiries for sheet and strip to be addressed to RICHARD THOMAS & BALDWINS (SALES) LIMITED, WILDEN, STOURPORT-ON-SEVERN, WORCS.

Enquiries for laminations to be forwarded to RICHARD THOMAS & BALDWINS LIMITED, COOKLEY WORKS, BRIERLEY HILL, STAFFS.

Our Cookley Works is one of the largest in Europe specializing in the manufacture of laminations for the electrical industry.

AVO INSTRUMENTATION

Pioneers in the design and manufacture of Multi-range Testing Instruments since 1923

D.C. Amplifiers
Radiation Monitors
Valve Voltmeters
Multi-range Testmeters
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and other electronic
and nucleonic instruments

AVO instruments are at the service of B.O.A.C. throughout the world

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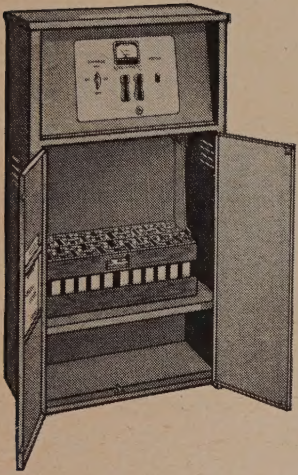
Telephone: VICtoria 3404 (12 lines) *Cables: Avocet, Sowest, London*
A MEMBER OF THE METAL INDUSTRIES GROUP OF COMPANIES

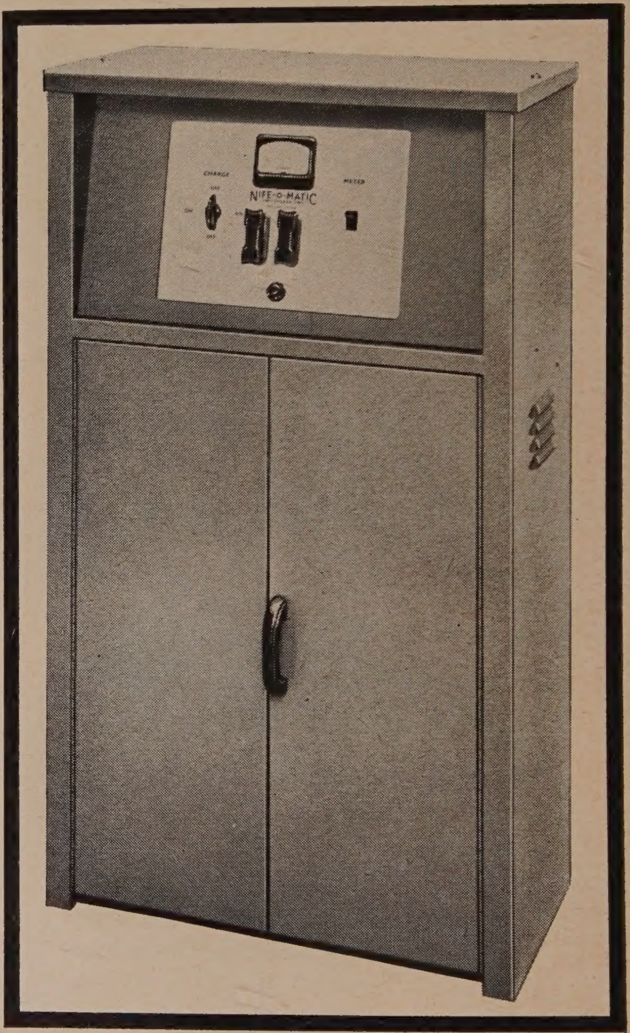
NIFE-O-MATIC

stays at the ready

WITHOUT SUPERVISION!

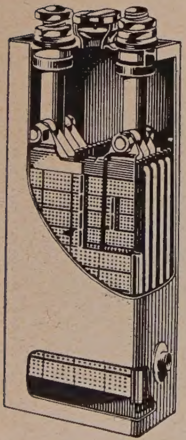


The Nife-o-matic system solves the problem of maintaining full closing and tripping voltage in a unit which can be safely left unattended for extensive periods. For this reason it cuts costs of operation and maintenance, and is suitable for a wide range of service in industry. Nife-o-matic units incorporating an automatic charge circuit are in addition to the well-tried NIFE manually operated units.



THESE ARE THE ADVANTAGES

- ✻ *Automatically compensates for normal discharges and external leakage currents, maintaining a fully charged battery*
- ✻ *Eliminates excessive gassing and frequent topping up*
- ✻ *Operation is* entirely *electrical and there are no moving parts*
- ✻ *Operation and maintenance costs lower than for any other type of unit*
- ✻ *Voltage stabilised for up to* ± *6% mains fluctuation*
- ✻ *Battery need never be removed for special charging*
- ✻ *All steel construction*
- ✻ *Installation does not require a special room*



Incorporates the famous NIFE Nickel-Cadmium Alkaline battery—the most frequently specified battery for switch-tripping applications

NIFE-o-matic

SWITCHGEAR ***for all industrial and sub-station applications***

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

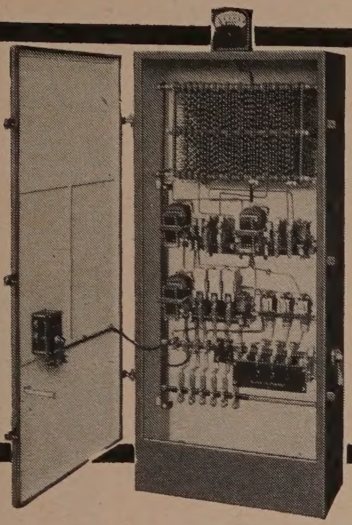
TGA NS152

"ERSKINE HEAP"

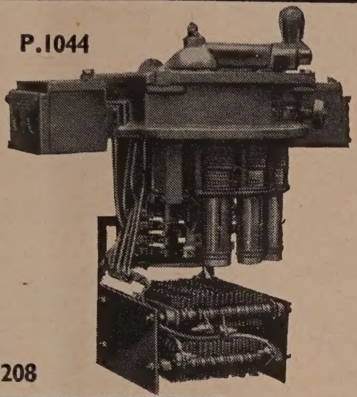
We manufacture all types of Stator and Rotor Starters for controlling Slip Ring Motors, both of the hand operated, oil immersed or liquid starter type and also the contactor type. Typical examples are illustrated.

SEND US YOUR ENQUIRIES

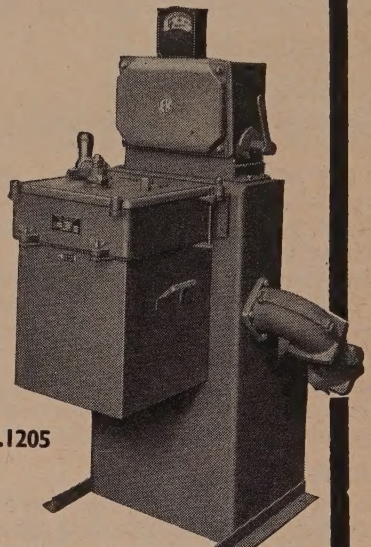
SLIP RING MOTOR STARTERS



P.1208



P.1044



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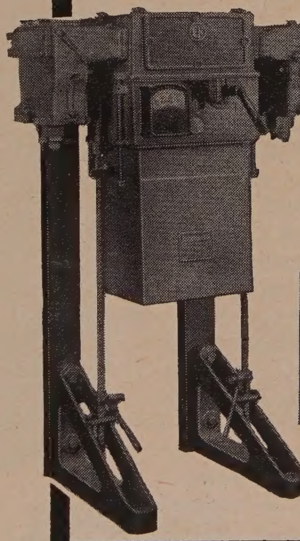
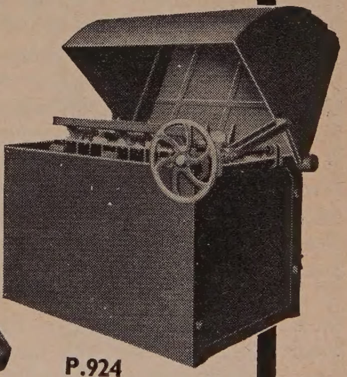


P.1025



P.924

P.1208

40 H.P. contactor type Stator and Rotor Starter.

P.1044

50 H.P. hand operated combined type, wall mounting oil immersed Stator and Rotor Starter with tank removed.

P.1205

125 H.P. hand operated combined type, floor mounting, oil immersed Stator and Rotor Starter, fitted with interlocked isolating gear.

P.1025 and P.924

Oil immersed stator circuit breaker and liquid type rotor starter for controlling slip ring motors. This is a very competitive method from 50 to 1500 H.P.

ERSKINE, HEAP & Cº LTD

SWITCHGEAR SPECIALISTS

Head Office & Works
BROUGHTON, MANCHESTER (7)

London Office
GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

The NEW range of—

"MEMREX-EXEL" 500 volt Switchgear

PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.

10—15—30 Amp. Switches
10—15—30—60 Amp. Switchfuses.

This new range of "Memrex-Exel" switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.
Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.
Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.
Fuses are of the new "Kantark-Exel" pattern which will accept rewirable or H.R.C. fuses.
Semi-enclosed rewirable (damper type) patterns comply with B.S.3036 : 1958.
H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S.88:1952, Appendix 'J' Dimensions.
M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88 : 1952, Appendix 'J' Dimensions, Form A—Offset Tags.
M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).

"Memrex-Exel" switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S.861: 1955 and B.S.2510: 1954.

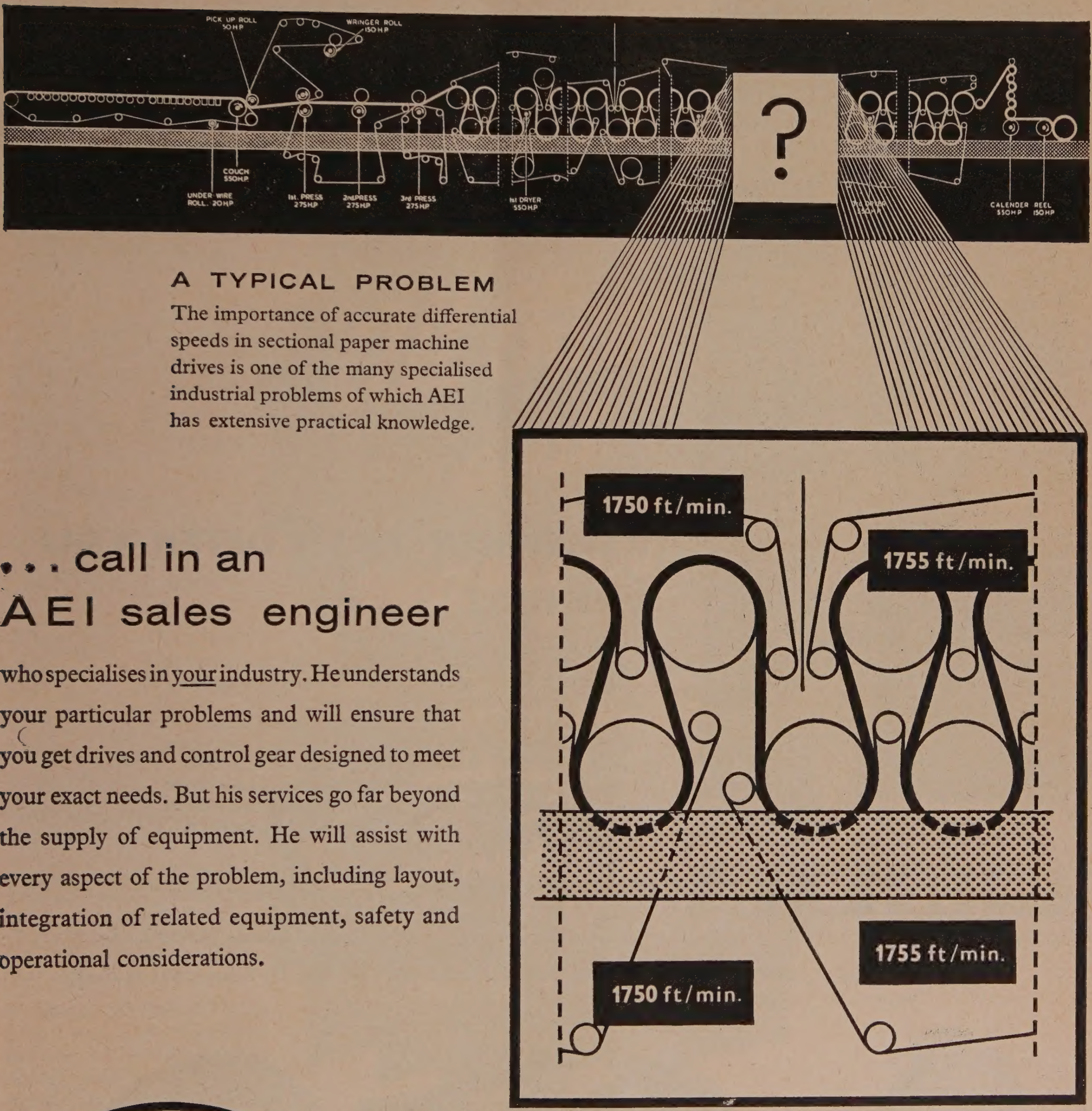
All these and many other features.

MEM

WRITE FOR LIST 447T

MIDLAND ELECTRIC MANUFACTURING CO. LTD.
REDDINGS LANE, TYSELEY, BIRMINGHAM, 11.

When you need more than just a motor...



A TYPICAL PROBLEM

The importance of accurate differential speeds in sectional paper machine drives is one of the many specialised industrial problems of which AEI has extensive practical knowledge.

. . . call in an AEI sales engineer

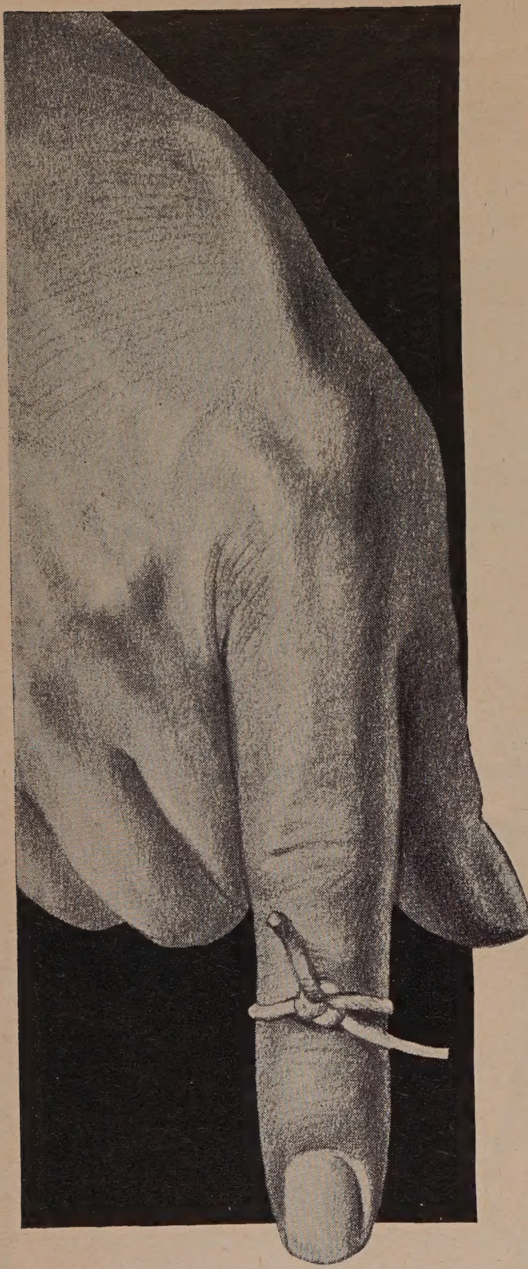
who specialises in your industry. He understands your particular problems and will ensure that you get drives and control gear designed to meet your exact needs. But his services go far beyond the supply of equipment. He will assist with every aspect of the problem, including layout, integration of related equipment, safety and operational considerations.

AEI

Associated Electrical Industries Limited
Motor and Control Gear Division
RUGBY & MANCHESTER, ENGLAND

INCORPORATING THE MOTOR AND CONTROL GEAR INTERESTS OF BTH AND M-V

A5422



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Fry's specialize in the production of top quality diecastings at an economical price. This is achieved by close collaboration with the customer from the design stage to the finished product and the full benefit of our long experience is at your disposal throughout. The capacity of our four works, already considerable, is continually being increased and the range of work undertaken embraces all non-ferrous alloys that can be cast by pressure or gravity. Whether your requirement is big or small, you can be sure of quality and happy about the cost when dealing with Fry's.

FRYS *The people with the facilities, capacity and achievements.*

SEND FOR OUR TECHNICAL BULLETINS **if you would like to know more about the production and cost-saving possibilities of diecasting.**

FRY'S DIECASTINGS LTD., Prince George's Road, London S.W. 19. *Tel: MITcham 2041 (6 lines)*
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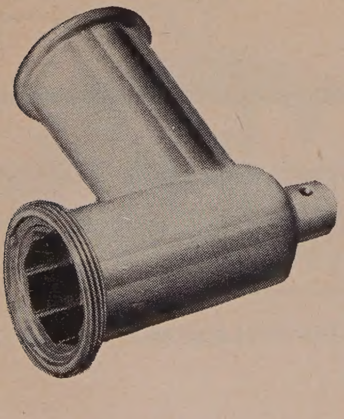

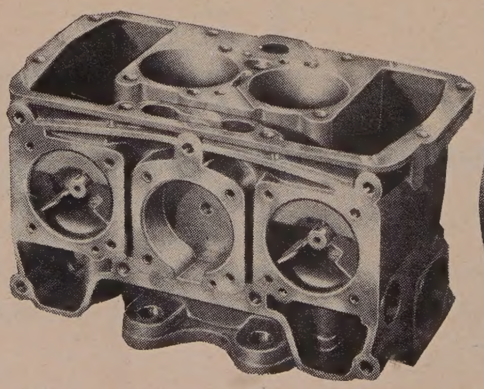

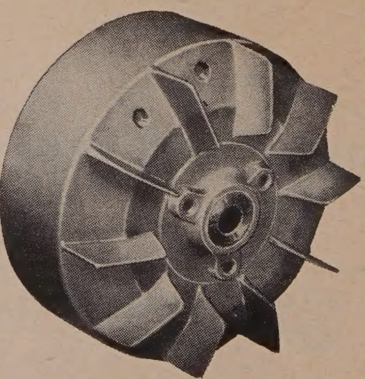

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ELECTROSTATIC AIR FILTERS

Hundreds of PRECIPITRON Filters have been installed in factories of all kinds, atomic energy establishments, commercial premises, hospitals and public buildings, to meet the need for *really clean air supplies*

Particulars are contained in our publication U7107 which will be sent on request

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CLEAN AIR

Electrostatic air cleaning was pioneered by Sturtevant in the United Kingdom with PRECIPITRON Air Filter

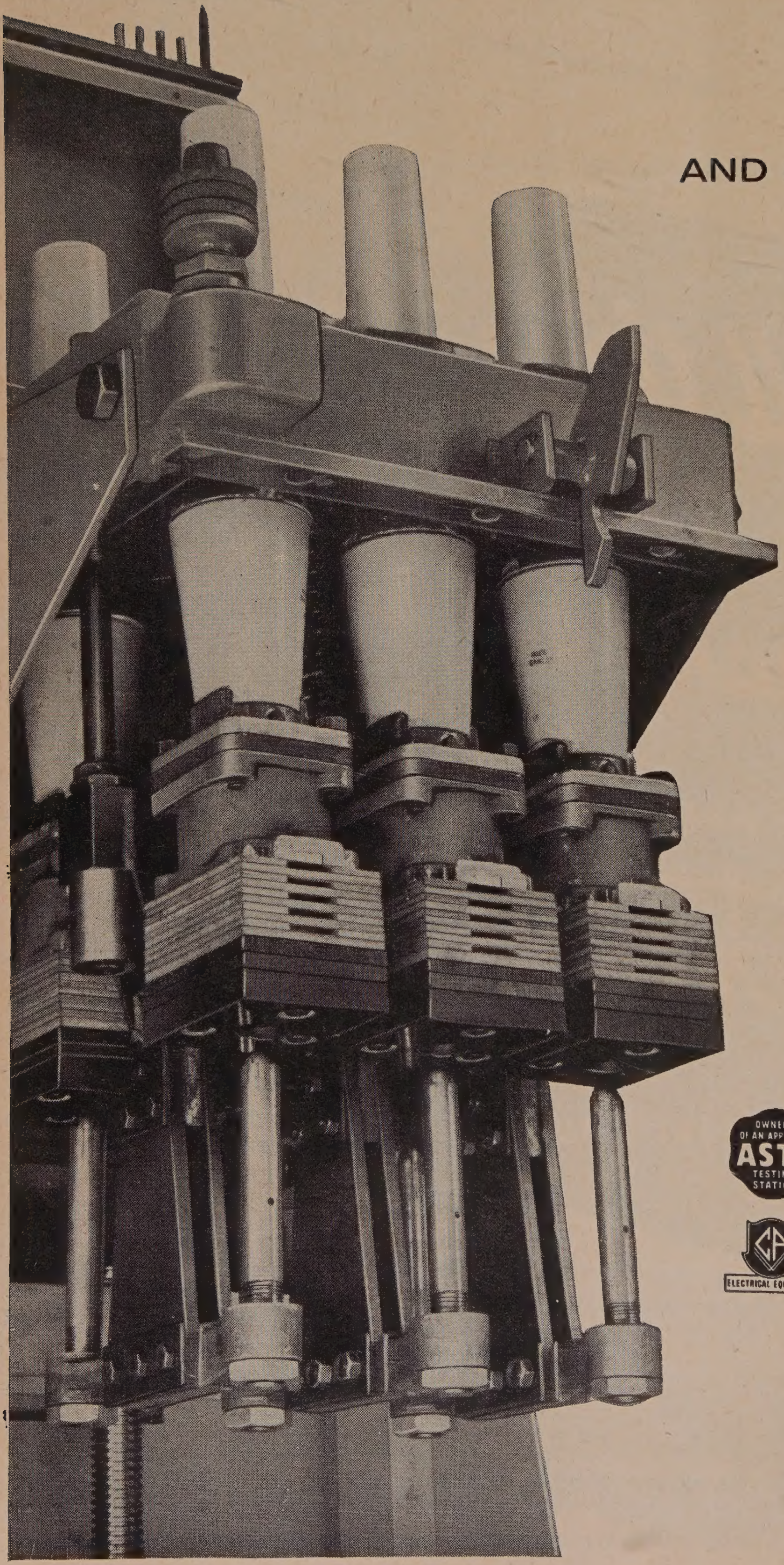
STURTEVANT ENGINEERING CO. LTD.

Southern House, Cannon Street, LONDON, E. C. 4.

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD. 400 SUSSEX STREET SYDNEY N.S.W.

DESIGNING

AND MAKING SWITCHGEAR



You, as an engineer, know that there can be no sharp dividing line between designing and building. A good design incorporates experience gained in making, testing and installing similar equipment in the past. And, of course, it is also shaped by the experience of all sorts of people using the earlier designs under a variety of conditions that could not be simulated in any test laboratory.

To a long-established company such as Crompton Parkinson this process of feedback of information to the designer is fundamental. It is the guiding factor in those details that defy specification but which, in aggregate, have so profound an effect on reliability and performance.

For example, the comprehensive ranges of Crompton Parkinson oil and air-break switchgear have been built up as the direct result of 60 years' experience in this field, backed by extensive development work in up-to-date research laboratories and an ASTA-approved testing station.

Testing of all types of switchgear is carried out under conditions far more severe than any likely to be encountered in service and during production, the performance of every unit is checked at all stages, up to complete assembly. This ensures the high standard of reliability and thermal and mechanical safety that is demanded of a 'balanced' switchgear design.

OWNERS OF AN APPROVED ASTA TESTING STATION

CP ELECTRICAL EQUIPMENT

Crompton Parkinson LIMITED

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, Switchgear, B.E.T. Transformers, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

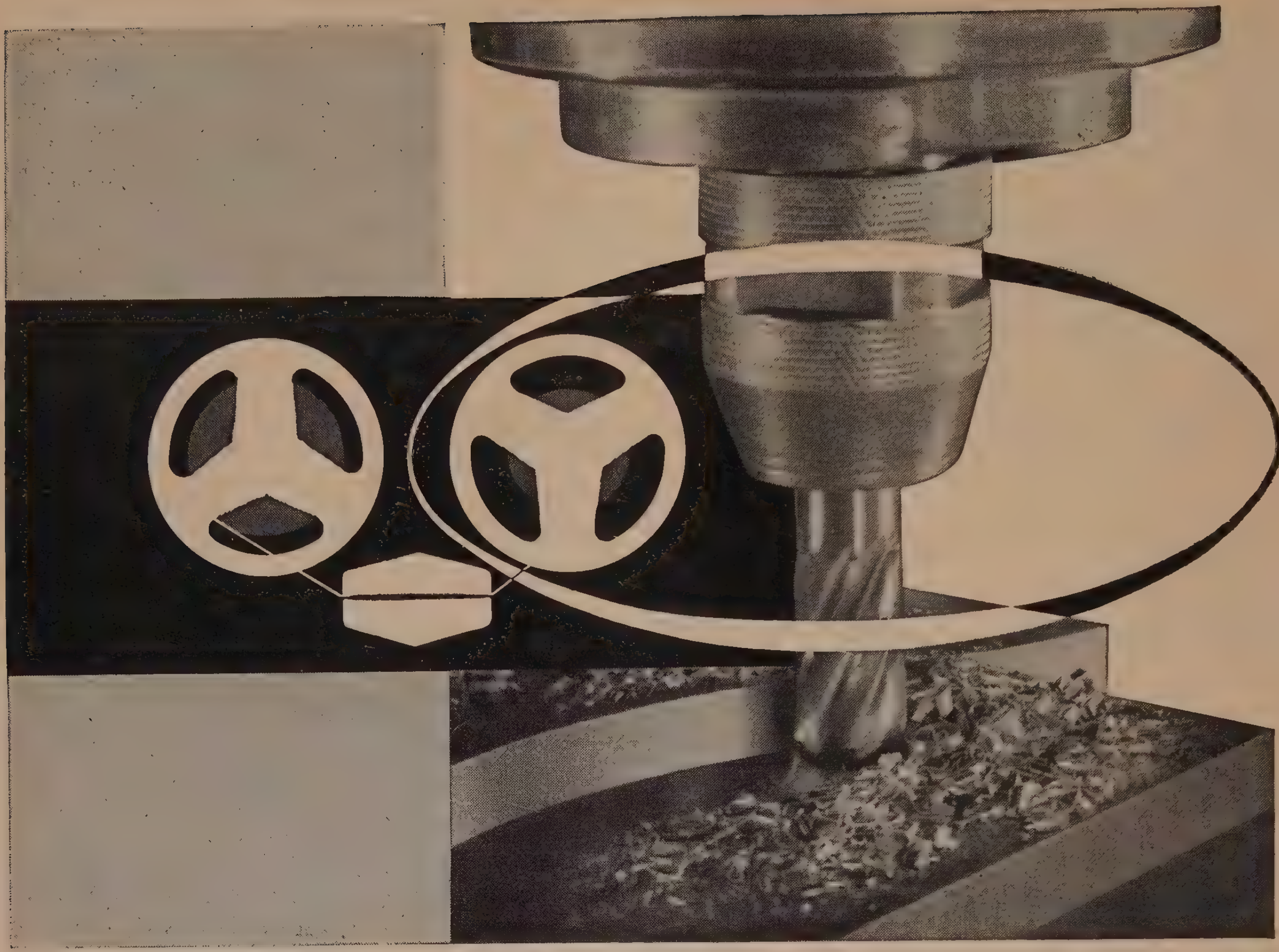
CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

This new freezer-refrigerator, selling at 75 gns. (or at very reasonable terms for customers using the 'Allied' Credit Plan, with no recourse to you) gives a higher-than-normal profit margin... Write now for details

It's the first LEISURE Freezer Refrigerator

ELECTRICAL APPLIANCE DIVISION
ALLIED IRONFOUNDERS LIMITED
ORCHARD HOUSE, ORCHARD STREET, LONDON W 1. TEL: MAYFAIR 8454

A silent Tecumseh Compressor-type refrigerator with 5½ cu. ft. capacity and 11 sq. ft. of shelf space.



New, advanced AEI electronic equipment

for CONTINUOUS NUMERICAL CONTROL OF MACHINE TOOLS

- Very high accuracy control by magnetic tape. The system is sensitive to 0.0001 in.
- Roughing and finishing cuts made from the same recording.
- Shop-floor adjustment provided for 'off-size' cutters.
- Tape reading equipment fully transistorised.

The AEI Tape Centre offers a high-speed tape preparation service

See this advanced equipment working on

STAND NO. 41, GRAND HALL

at the INTERNATIONAL MACHINE TOOL EXHIBITION

AEI

Electronic Apparatus Division

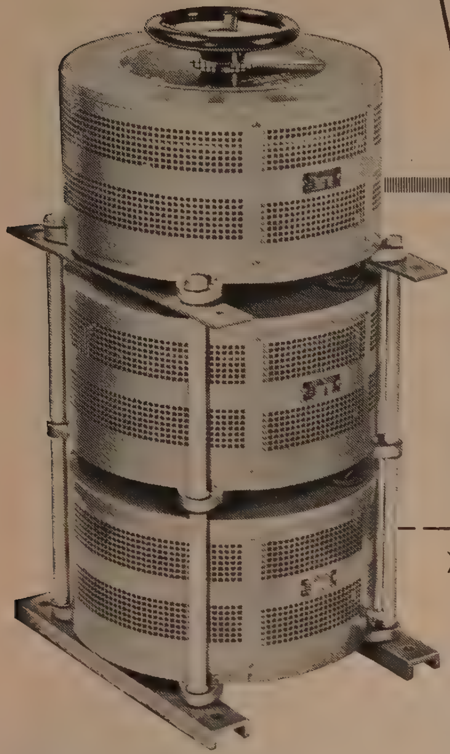
Associated Electrical Industries Limited

NEW PARKS, LEICESTER, ENGLAND

A5526

Variac WITH Duratrak*

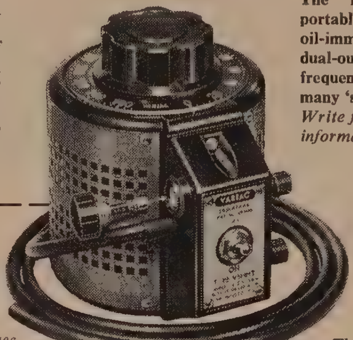
Regd. Trademark



This 3-gang assembly, Type 50-BMG3, will control 22·5kVA, 3-phase or single-phase according to connection. Larger assemblies can be made.

THE MOST USEFUL DEVICE KNOWN FOR THE CONTROL OF AC VOLTAGE

VARIAC is the original continuously-adjustable auto-transformer, providing a smoothly variable output from zero to line voltage and above.
VARIACS are available in a very wide range of models from small units for laboratory and instrument use to large ganged assemblies for three-phase power.
VARIACS are available open or covered, as single units or ganged assemblies, for manual operation or motor-driven.



The range includes portable, metalclad and oil-immersed models, dual-output types, high-frequency types and many 'specials'. *Write for complete information.*

★ Duratrak? Duratrak (Regd. Trademark) —a patented* feature exclusive to Variac—is a special plated contact surface giving longer life, increased overload and surge capacity and maximum economy in maintenance. Duratrak is now standard on all models except Series 50.

**U.K. Pat. No. 693406*

ONLY VARIAC HAS DURATRAK

This small Variac, Type V-5HMTF, provides an output of 0-270 V, 2 A, from 240 V 50 c/s mains. A still smaller model, Type V-3H is rated at 1 A.

Claude Lyons Ltd.

VALLEY WORKS · HODDESDON · HERTS · TELEPHONE: HODDESDON 4541 (6 LINES)
Registered office: 76 Old Hall Street · Liverpool 3.

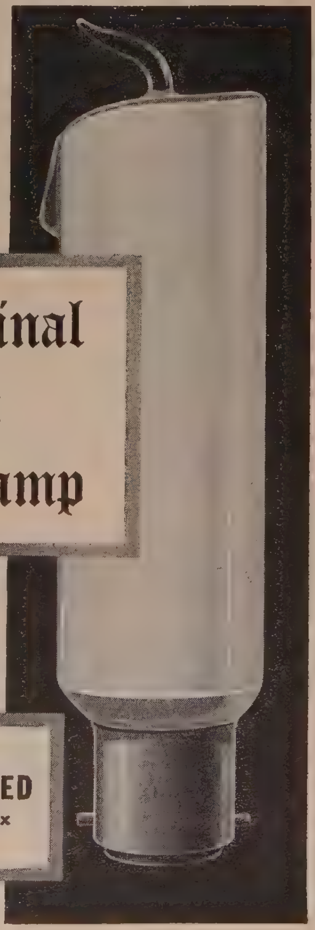
CL59/2A

Are Pressings your Problem?

If the answer is 'yes let us solve your problems for you. We manufacture precision presswork to any specification required, efficiently and with prompt attention. Every order is handled with the same interest and care that has built our reputation as master craftsmen. This reputation is your assurance of complete satisfaction. We invite your enquiries. The items illustrated are a few from our range of pressings for the Electrical Industry.

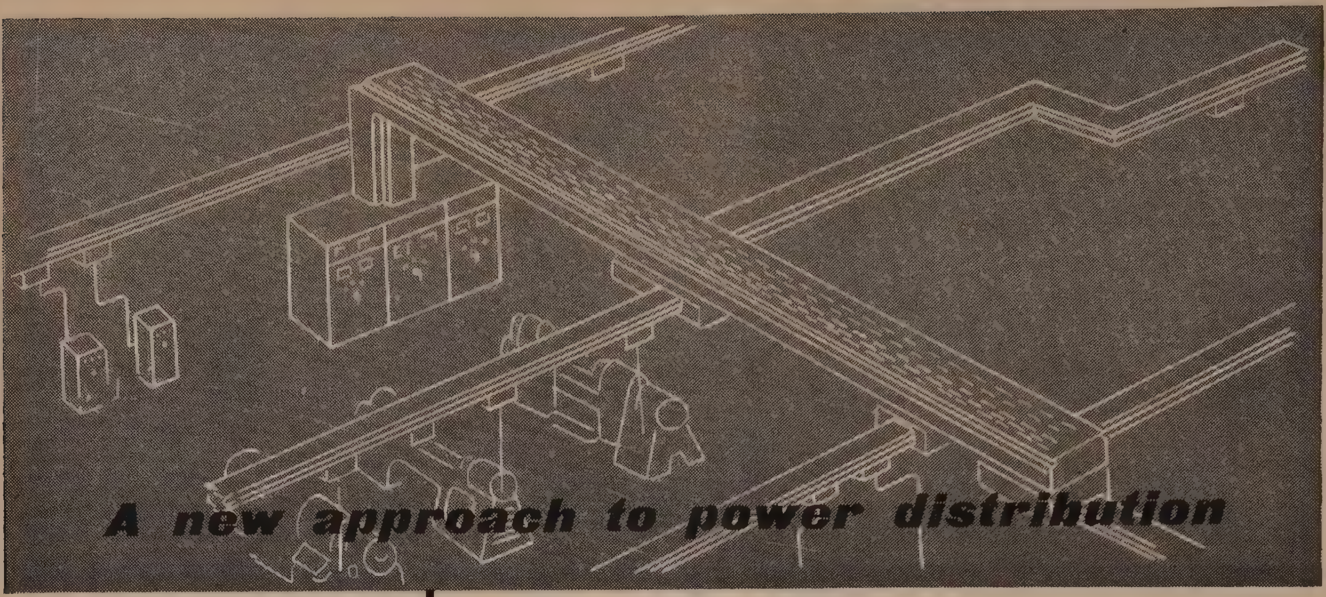
HAMPTON WORKS
(STAMPINGS) LIMITED
TWYNING ROAD · STIRCHLEY · BIRMINGHAM 30
Tel: KINgs Norton 2901 Grams: RADIAGILLS BIRMINGHAM

The Original Artistic Candle Lamp



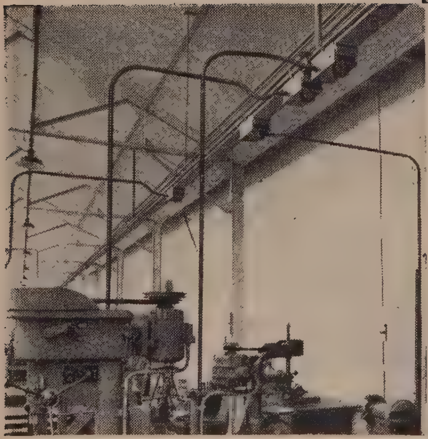
In addition to a complete range of G.L.S. and modern contemporary lamps we also supply in 25W. and 40W. White or champagne colour glazed, red or green.* Standard Caps B.C. and S.B.C.
*Colour Sprayed.

All enquiries to:
ISMAY LAMPS LIMITED
Roden Street Works, Ilford, Essex
Telephone: ILFORD 1153


A new approach to power distribution

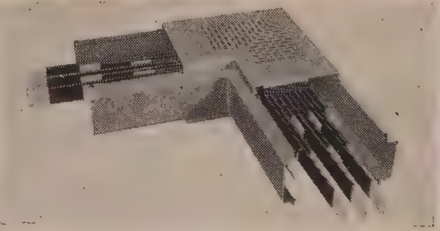
ECONOMICAL
FLEXIBLE
SAFE TAP-OFF BOXES
SILVERED CONTACTS AT JOINTS

British CANALIS BUSBAR TRUNKING

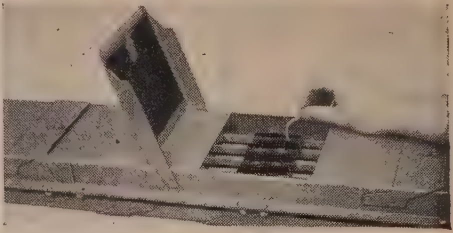


British Canalis Universal applied to workshop distribution. Tap-off boxes easily located adjacent to machine.

- HEAVY STEEL CASING.
- PLUG-IN TAP-OFF BOXES FEED SERVICE CIRCUITS AND ARE FIXED WITHOUT TOOLS.
- OPENING LID OF BOX AUTOMATICALLY DISCONNECTS FROM BUSBARS.
- CONTINUOUS EARTH BAR.
- EASY TO ERECT.



Corner section of heavy current trunking of 1,500 amps rating showing interleaved busbars.



Method of joining sections of British Canalis Universal.

BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD. LOUGHBOROUGH

(Member of the Hawker Siddeley Group)

It's aluminium

Sheathed in *seamless* extruded aluminium, this cable is lightweight yet strong. It needs no armouring, thus allowing simple cable design. With a high resistance to vibration fatigue, it can be used with complete safety, alongside railways etc.

It's flexible

Corrugation results in greater flexibility, permitting the same bending radius as a lead sheathed cable. Not only are handling qualities improved but corrugation reduces the required thickness of the sheath *by one half*.

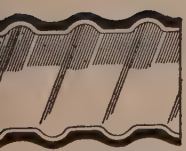
It's a money saver

Initial costs are therefore lower than conventional type cables of similar performance. Lightness and flexibility simplify transportation and installation. No special precautions are necessary to allow for expansion and contraction.

Further information is available on request.

It's the **BICC** C.S.A. cable

CORRUGATED
SEAMLESS
ALUMINIUM



PROTECTIVE SERVING

Anti-corrosion protection is provided by an extruded P.V.C. covering which fits tightly over the whole sheath surface. *See section view.*

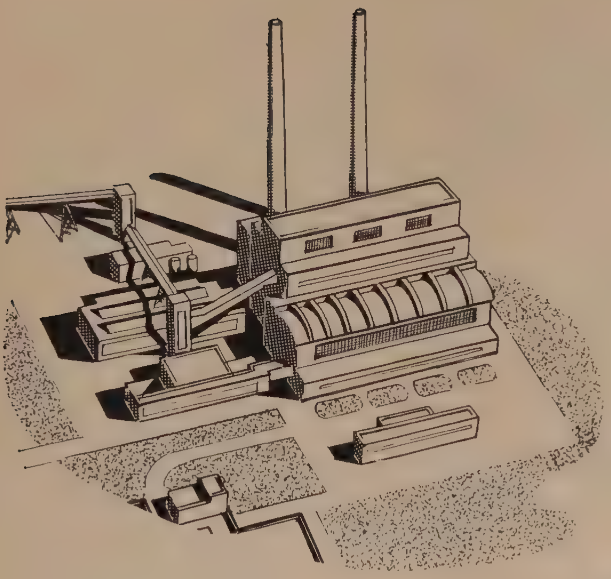
INSTALLATION

Conventional installation procedure is followed. Jointing techniques are the same as for normal smooth aluminium-sheathed cables.

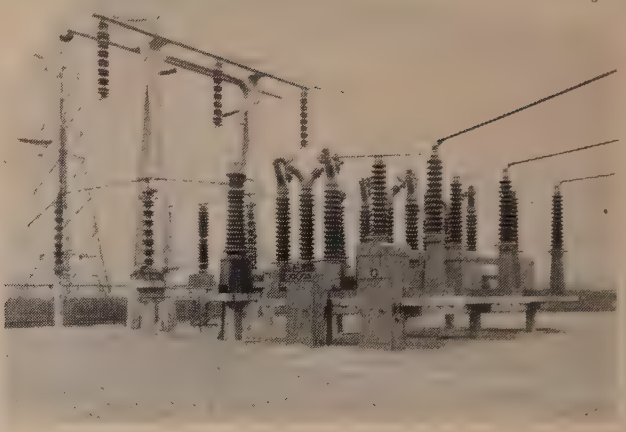
CABLE TYPES

C.S.A. sheathing is available with BIC Mass - Impregnated Non - Drainir (M.I.N.D.) Cables up to 33kV and f Oil-Filled Cables.

BRITISH INSULATED CALLENDER'S CABLES LIMITED 21 BLOOMSBURY STREET LONDON W C 1

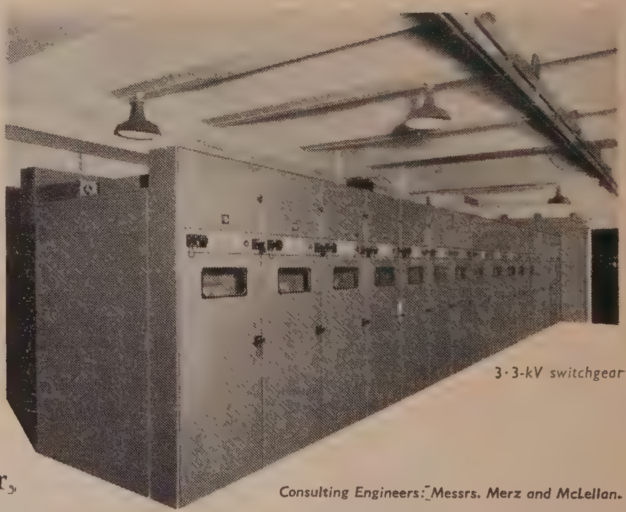


Blyth A
GENERATING STATION



275-kV switchgear

Main control-room



3·3-kV switchgear

Consulting Engineers: Messrs. Merz and McLellan.

Photographs by courtesy of C.E.G.B., North Eastern Division.

Reyrolle supplied the 275-kV
air-blast switchgear,
66-kV small-oil-volume switchgear,
3·3-kV air-break auxilliaries switchgear,
and 415-volt distribution gear
together with associated
control-equipment.

Reyrolle

A. REYROLLE & COMPANY LIMITED - HEBBURN - COUNTY DURHAM - ENGLAND

Flying saucers (and cups!)

High above the clouds an air hostess serves refreshments, depending on the electric plates and grills in the compact galley of the aircraft to heat the prepared meals and make coffee for her passengers. Wires with special insulations are needed in grills, cookers, motors, and other electrical equipment to enable them to operate in varying temperature conditions, illustrating some of the many needs for LEWCOS insulated wires and strips in everyday living.

L·E·W

WIRESMITHS TO THE ELECTRICAL WORLD

E LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED · LEYTON · LONDON · E.10

ROTUNDA 'SLIPKNOT' BLACK ADHESIVE ELECTRICAL INSULATING TAPE

Rely on ROTUNDA

Typical Test Results on Rotunda "Slipknot" tape

DIELECTRIC STRENGTH (volts at breakdown) 1000 volts (minimum) (1 minute proof-test, BS.1078)

INSULATION RESISTANCE 100 megohms Method of BS.1078

ADHESION before ageing test (BS.1078) 5.0 inches

ADHESION after ageing test (120 hrs. at 82°C) 5.0 inches

Remarks: Adhesion results give rate of unwinding by use of specified weights.
It is the user's safeguard against the tape drying out whilst in use on vitally important insulation jobs.

FRICTIONED No plucking of the insulating compound from the fabric.

Fully complies with BSS. 1078/1954

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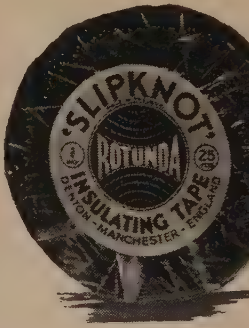

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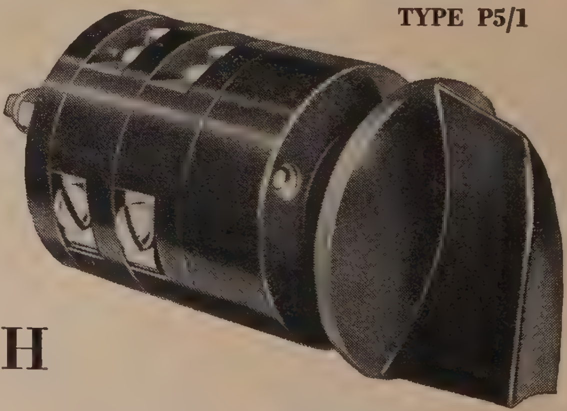

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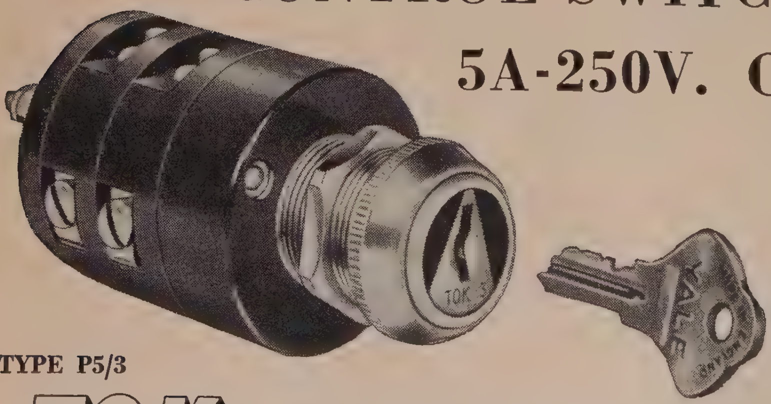

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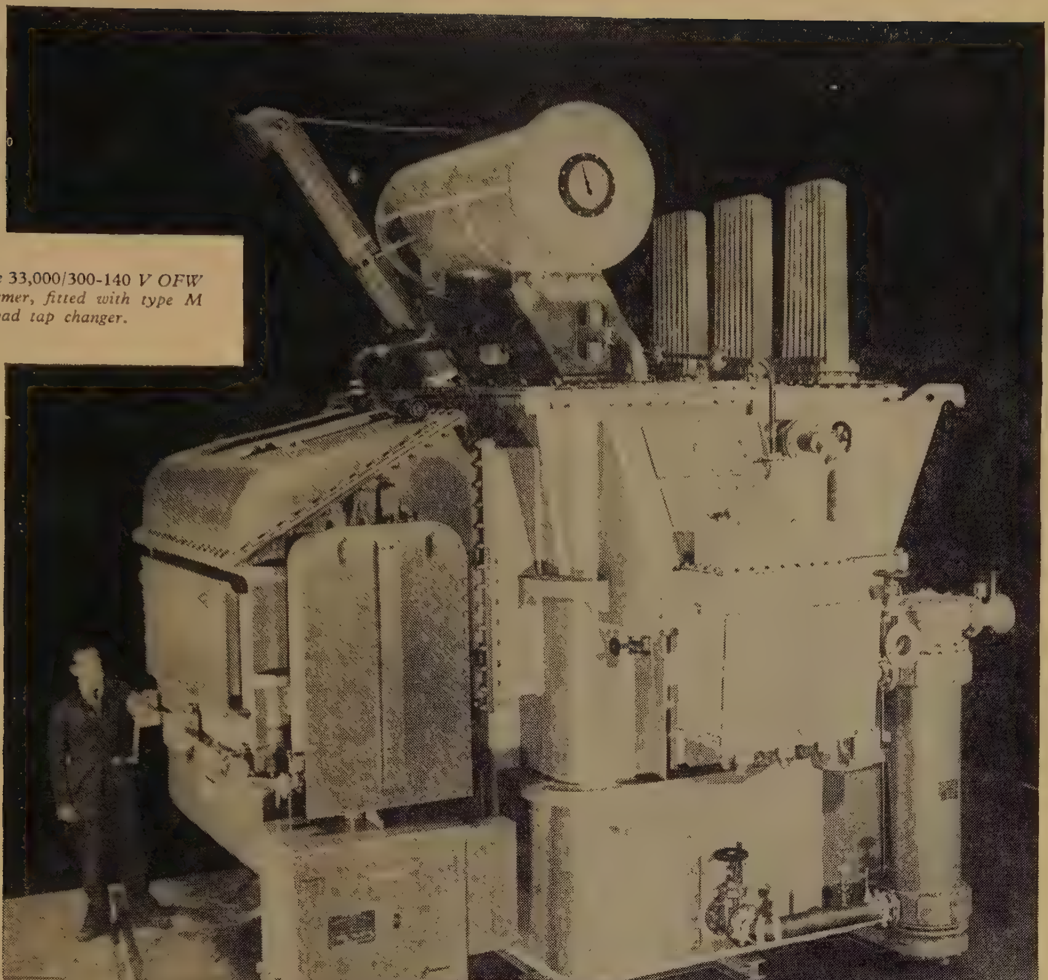
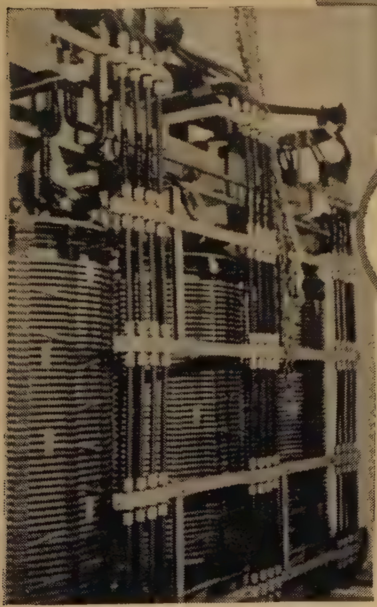


A 10,000 kVA, 3-phase 33,000/300-140 V OFW cooled furnace transformer, fitted with type M resistor transition on-load tap changer.

PHOTO BELOW *by courtesy of N.V. Ned. Kabelfabrieken, Alblasserdam.*



AFTER TEN YEARS' SERVICE

This illustration shows the excellent condition of the windings and connections of a 7,500 kVA, 3-phase, 12,500/234-92 V furnace transformer, removed from its tank for inspection after 10 years' service in Holland.

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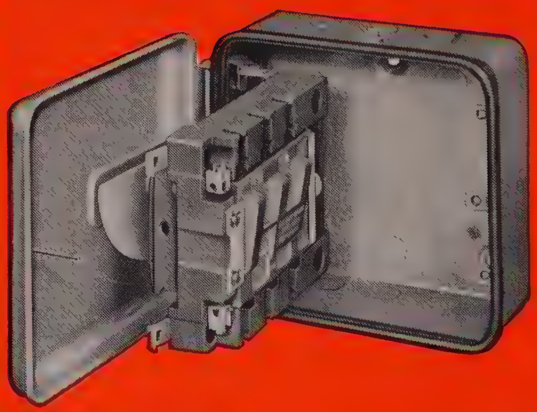

Star Switchfuse with cover open showing interior hinged forward for ease of wiring

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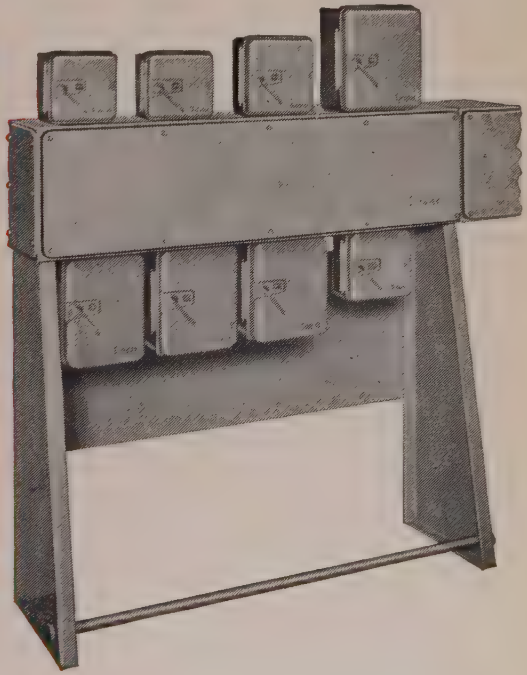

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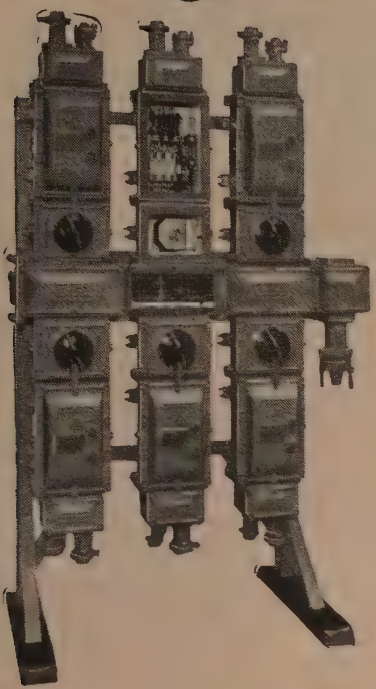

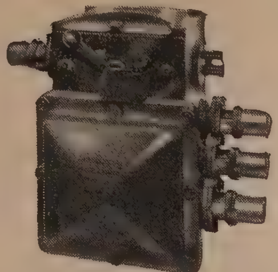

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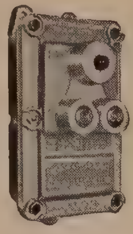

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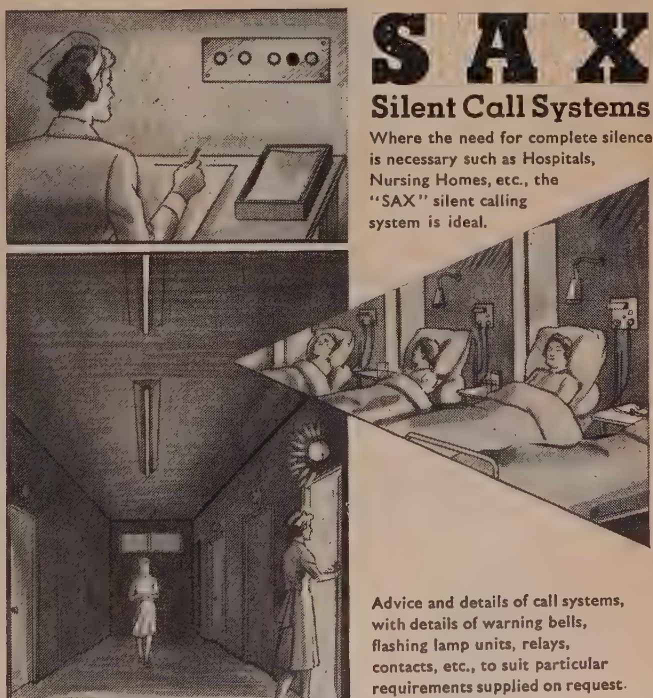

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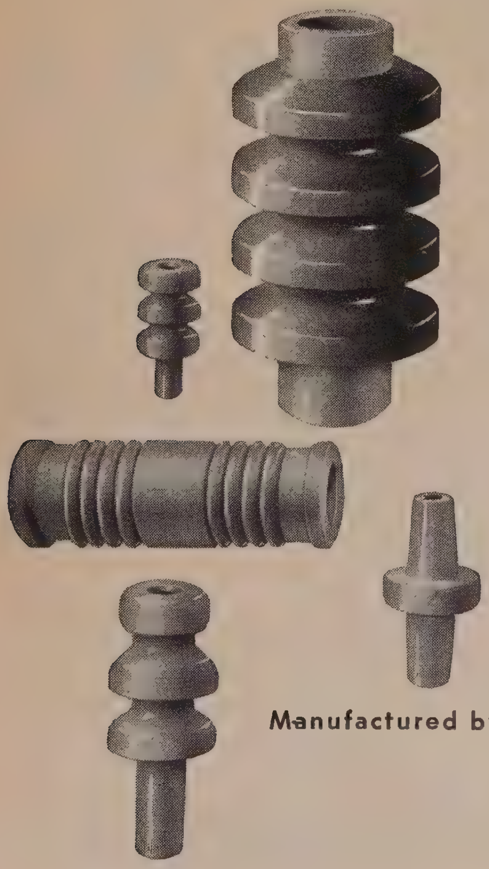

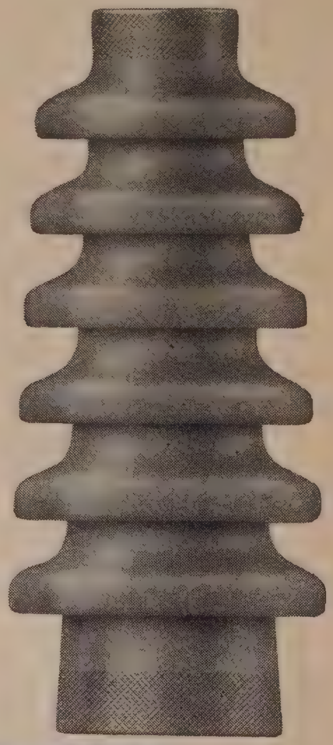

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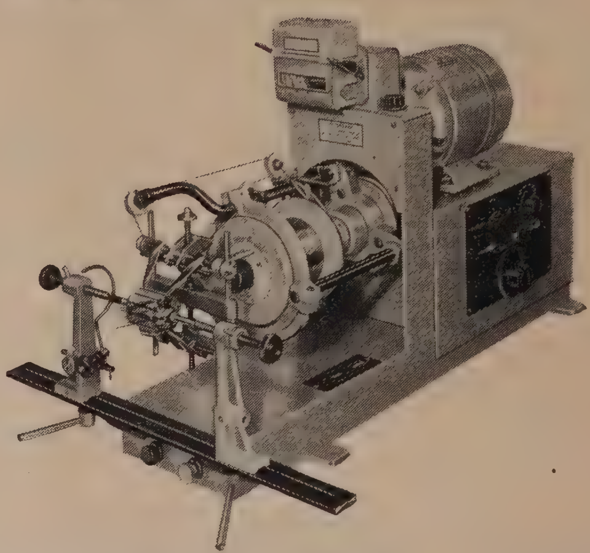

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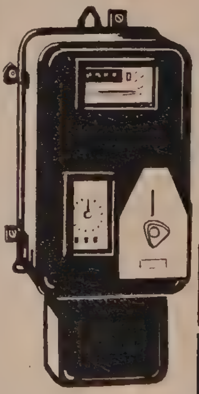

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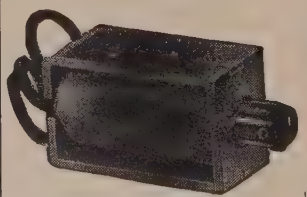

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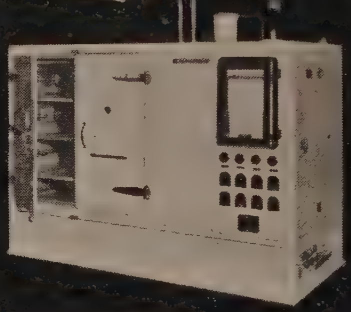
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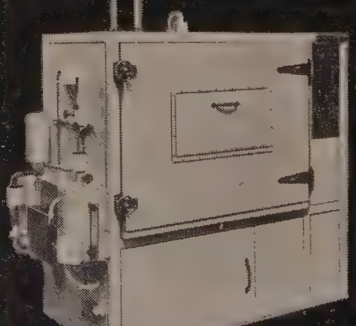
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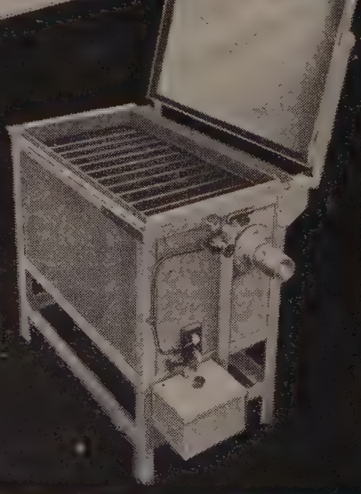
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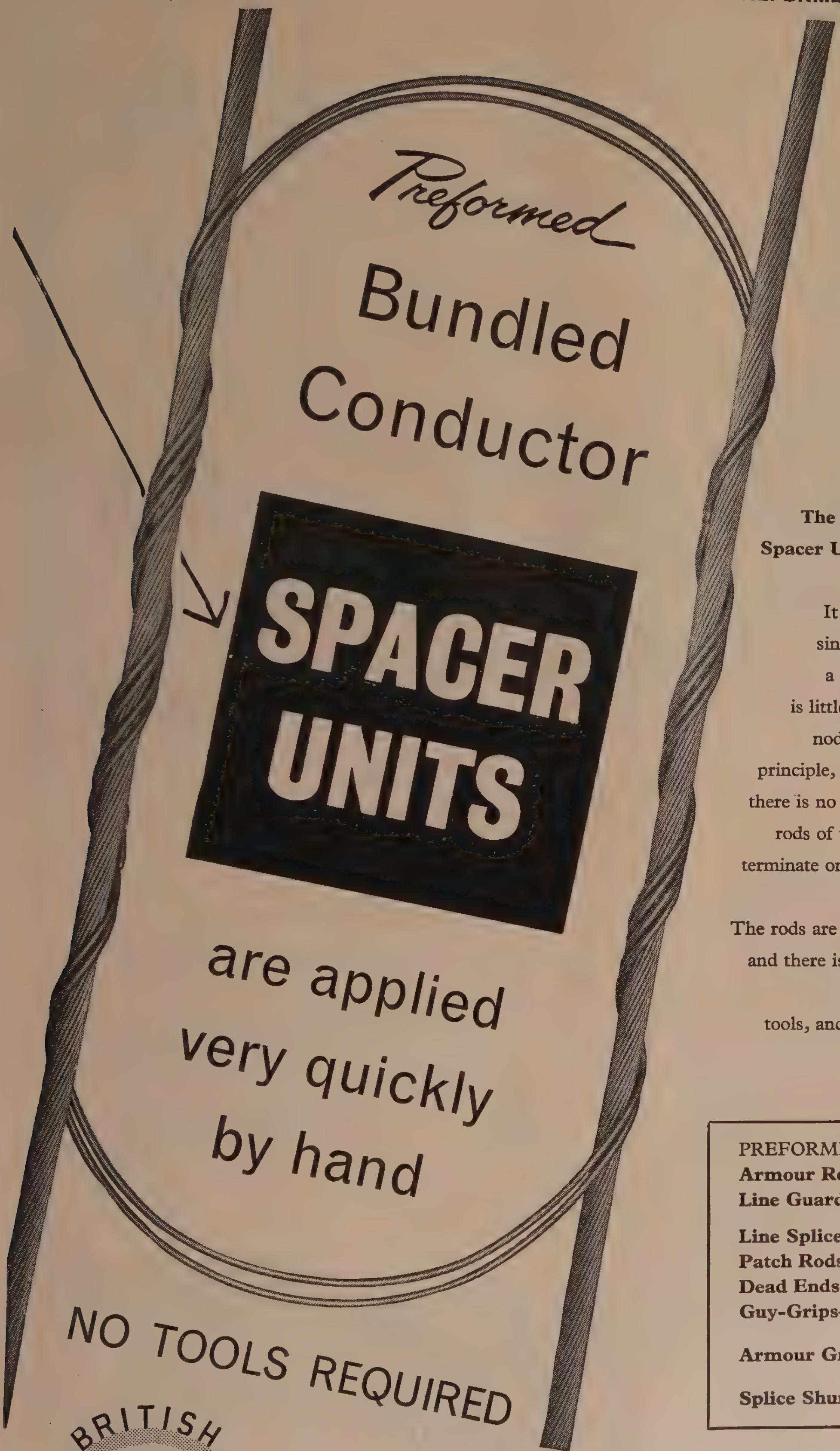

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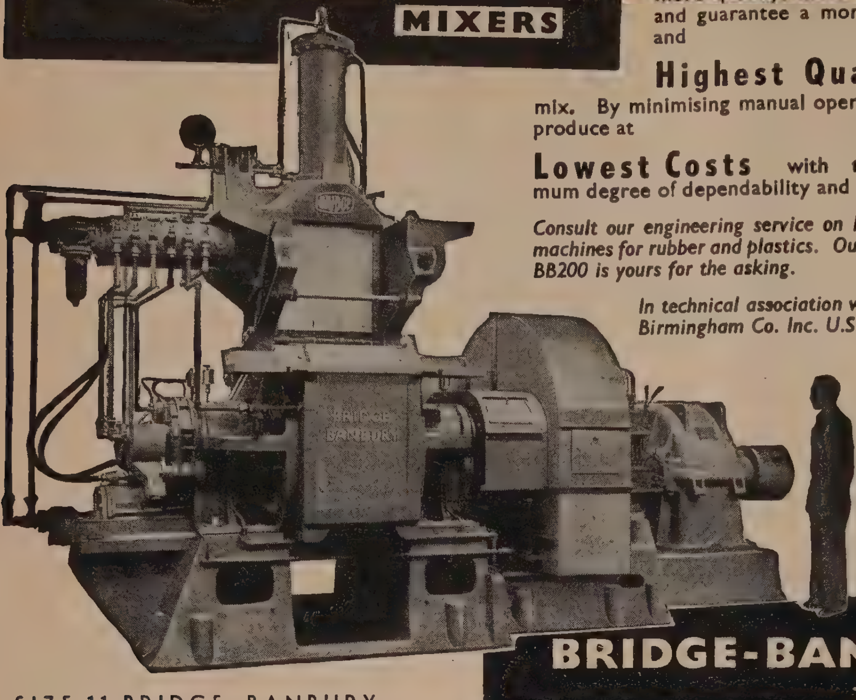

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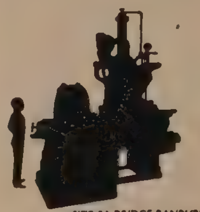

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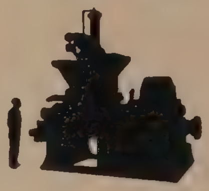

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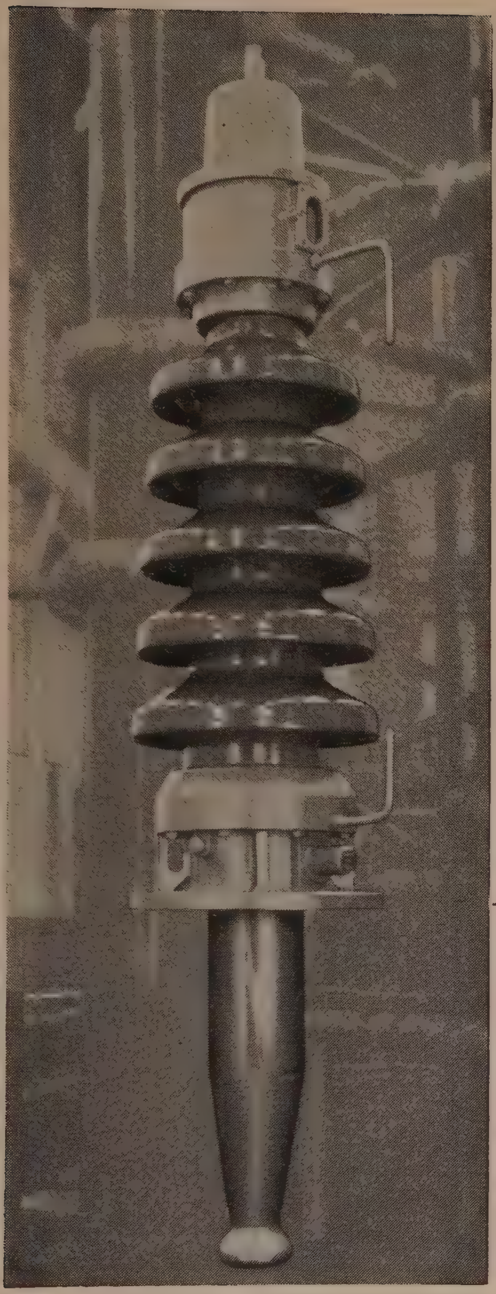

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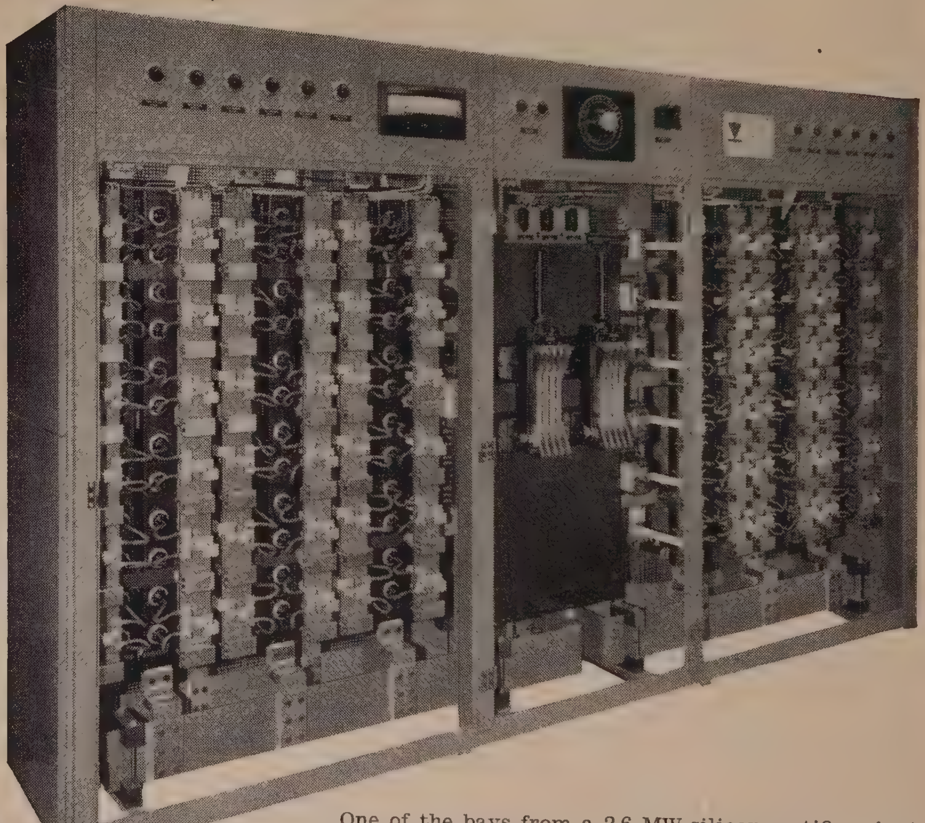

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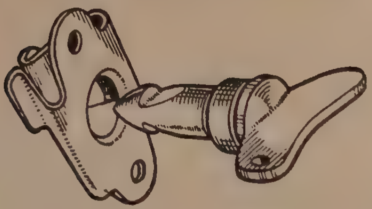

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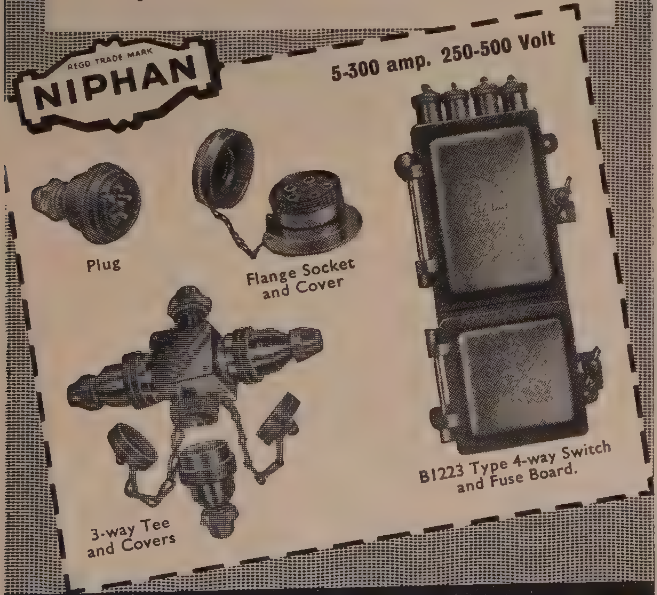

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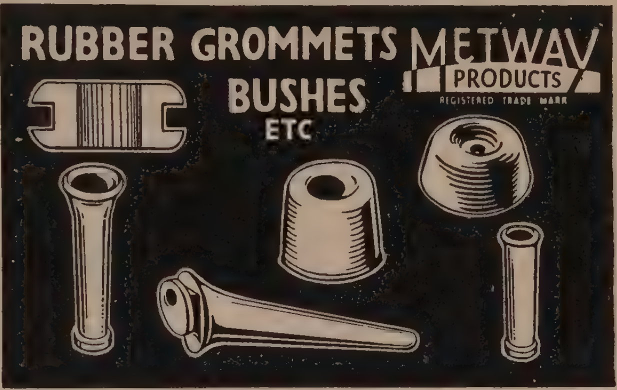

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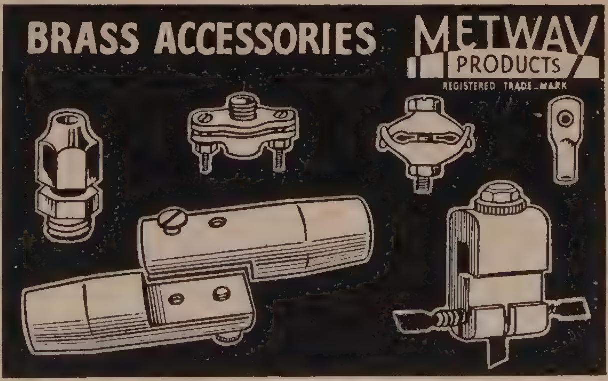

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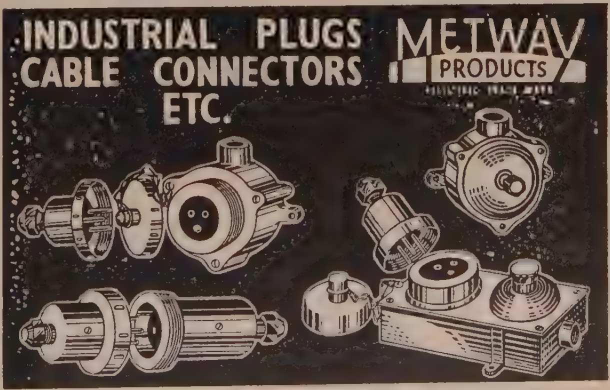

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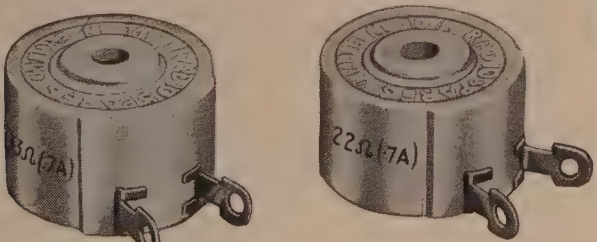

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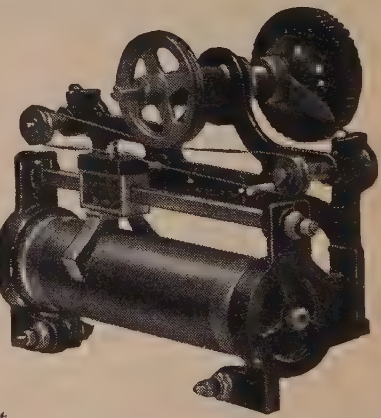

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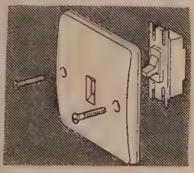

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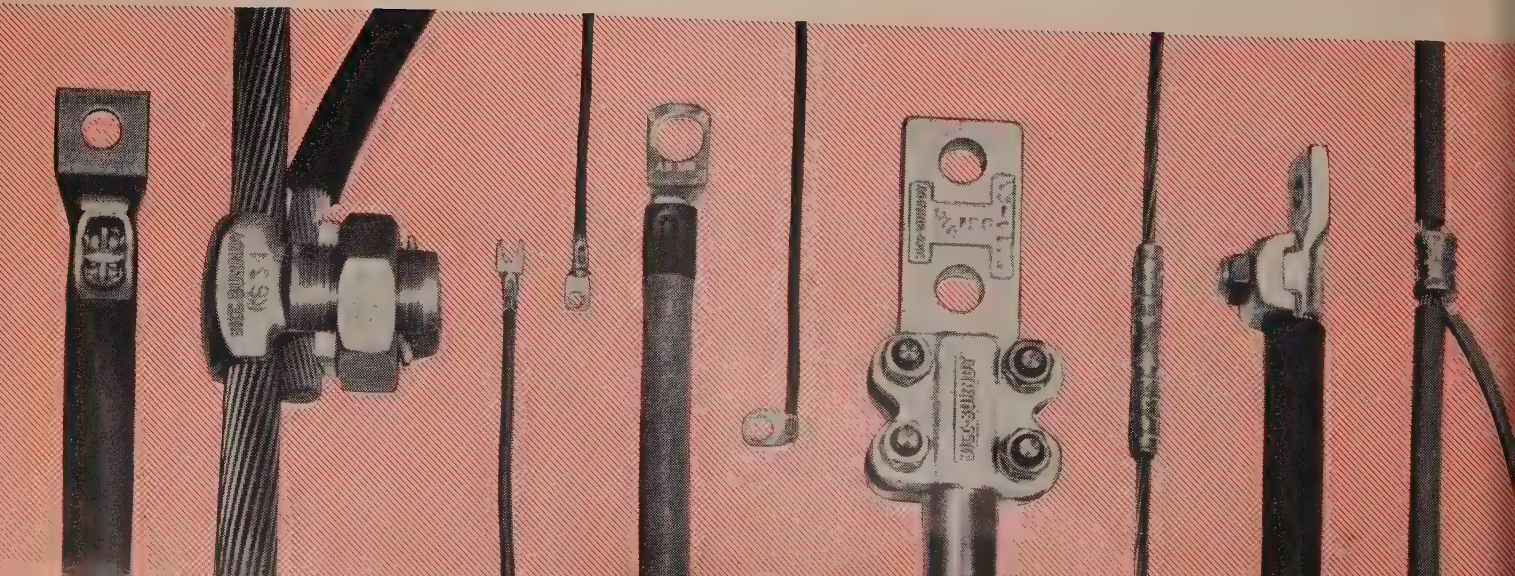

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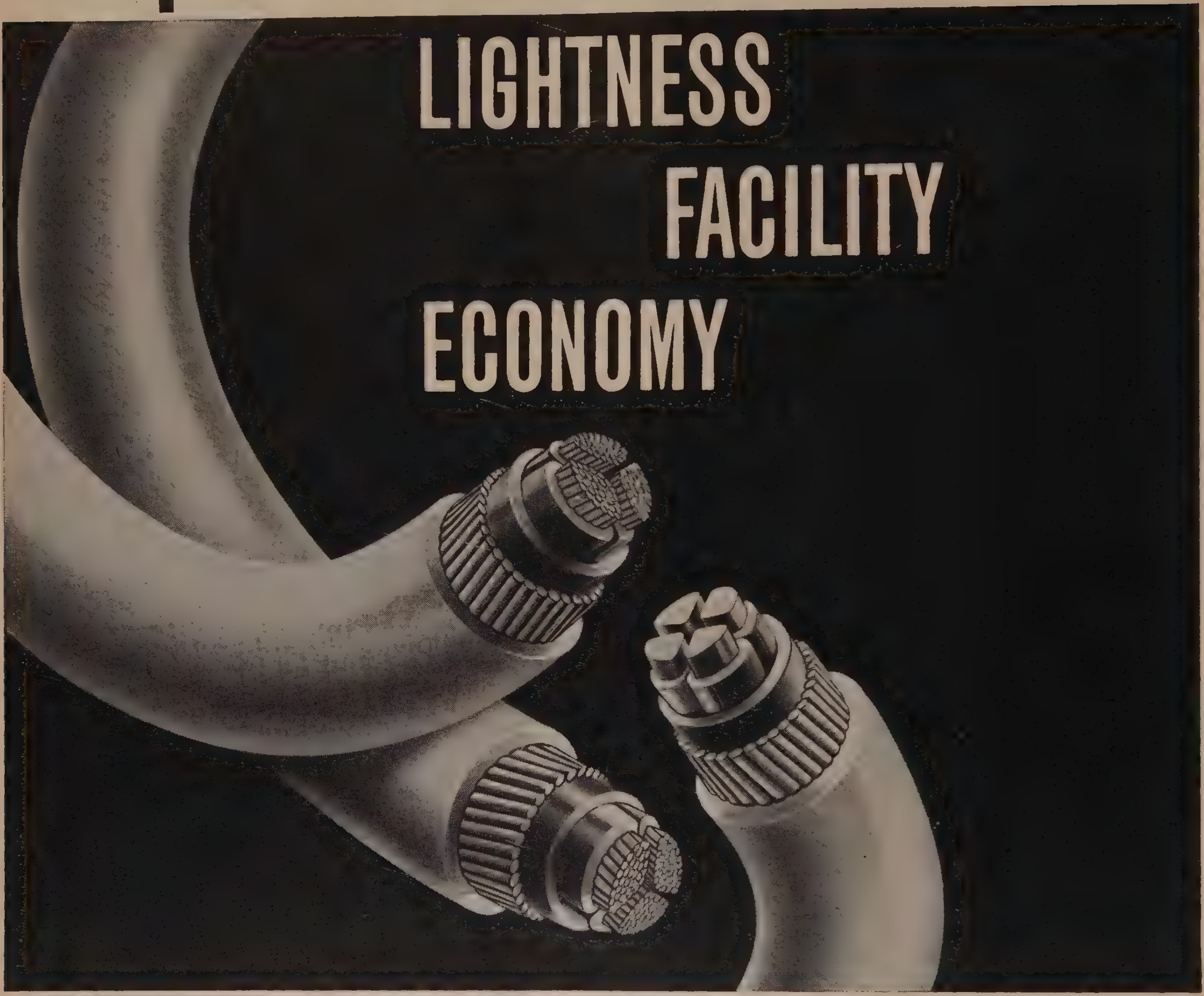

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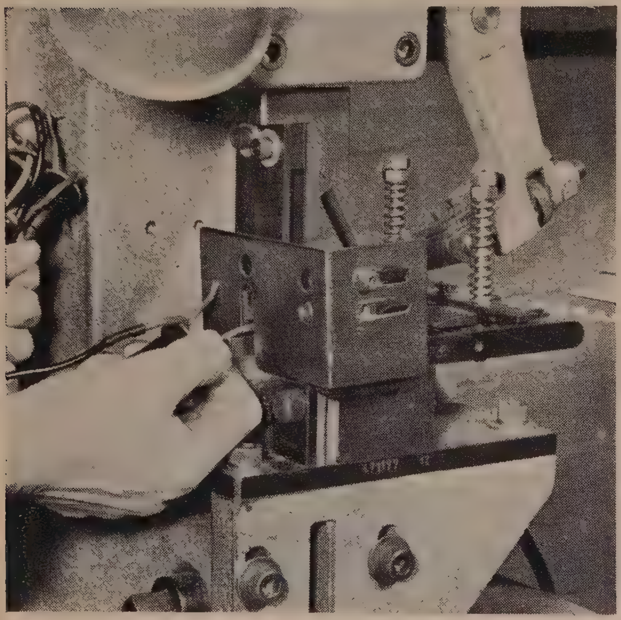
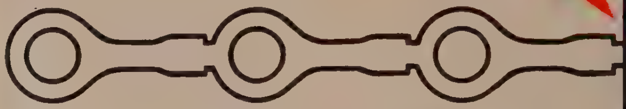


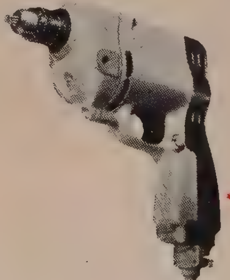
Application of Ring Tongue Terminals to Tool leads.

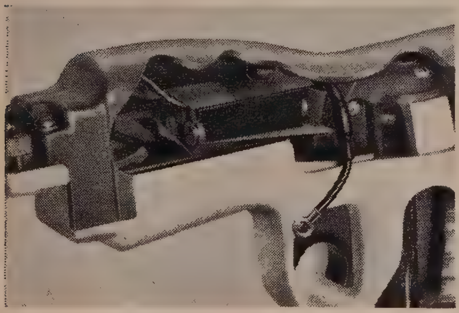


Ring Tongue Terminals.

Acknowledgements to Wolf Electric Tools Ltd.

Safetymaster Tool (with complete casing)





Close up showing Terminal fitted to lead suppressor.

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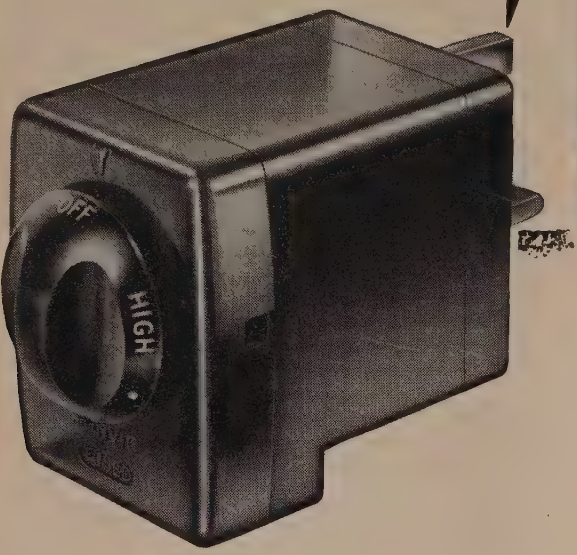

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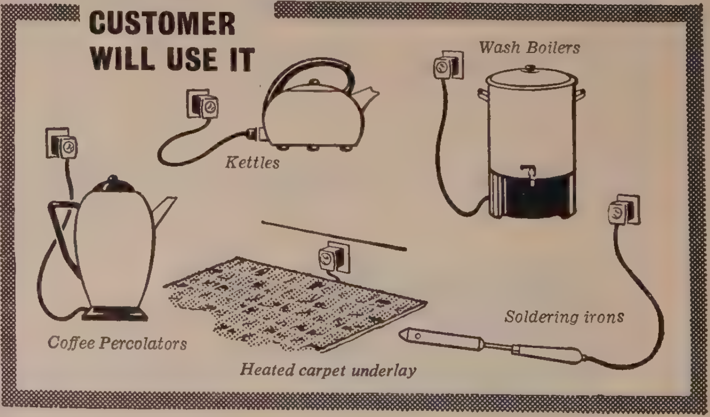

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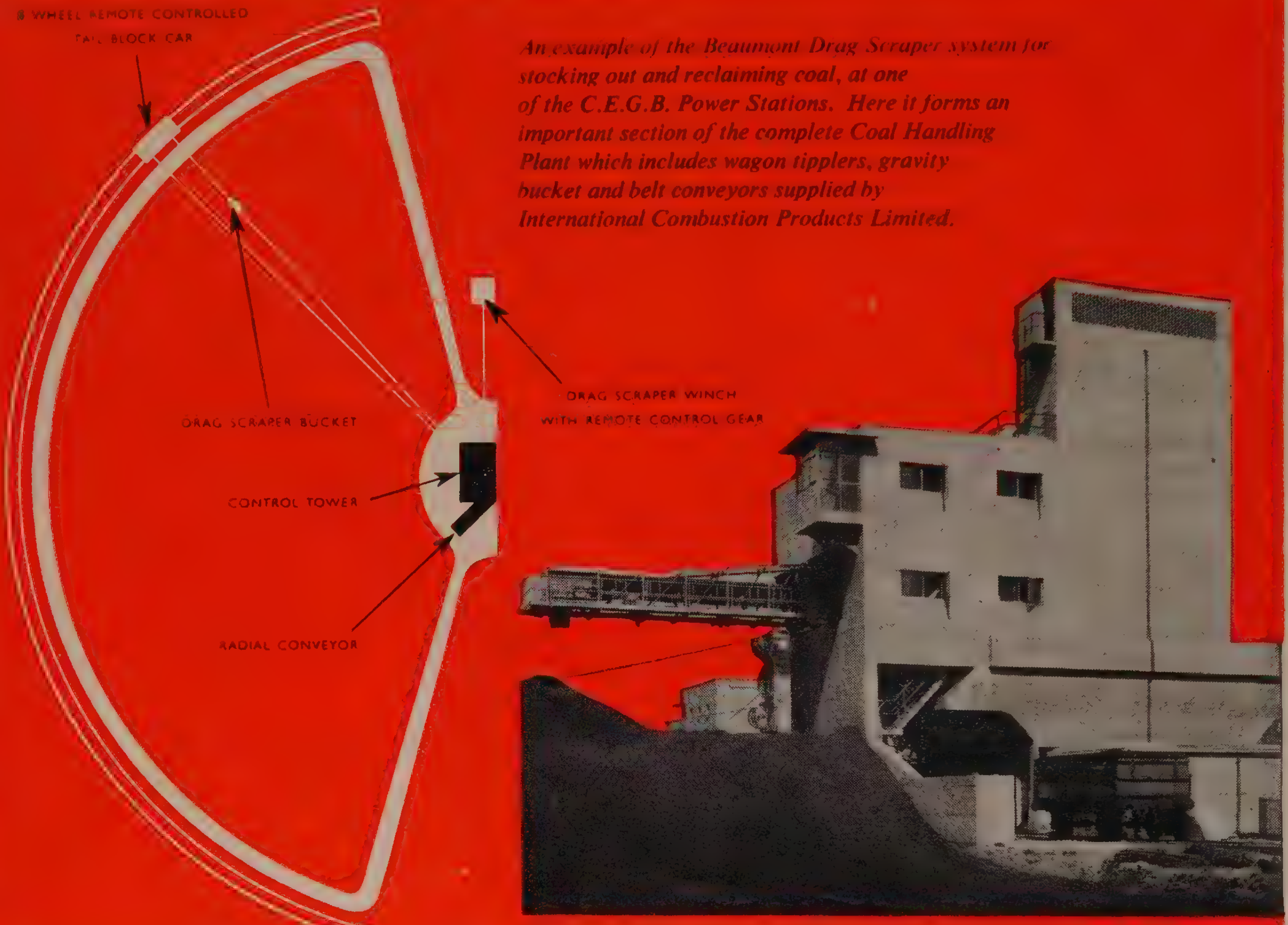

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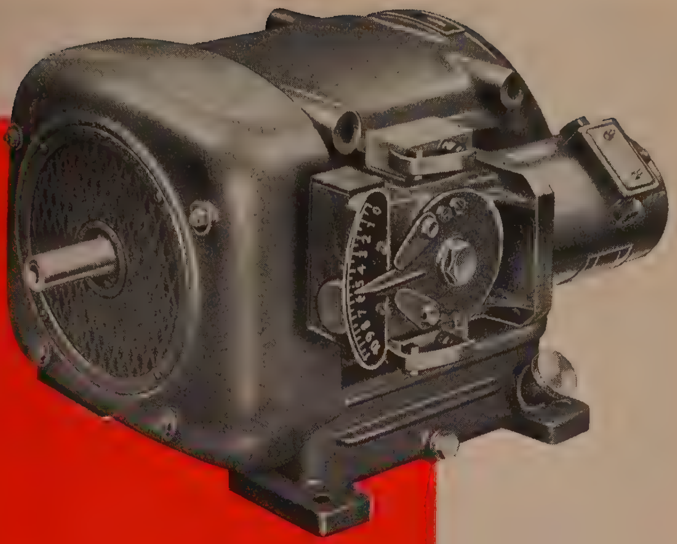

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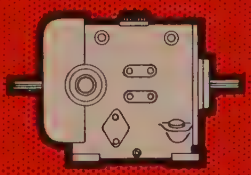

'F' Type Carter Variable Speed Gears. ¼ h.p. up to 3 h.p. Handwheel, Hydraulic Relay, Lever or Remote Electrical Controls.

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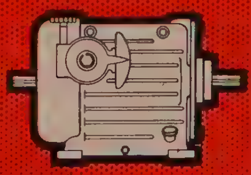

'A' Type Carter Variable Speed Gears. 1⅝ h.p. up to 21½ h.p. Handwheel, Remote Electrical or Drilled Lever Controls.

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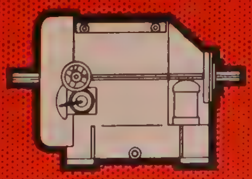

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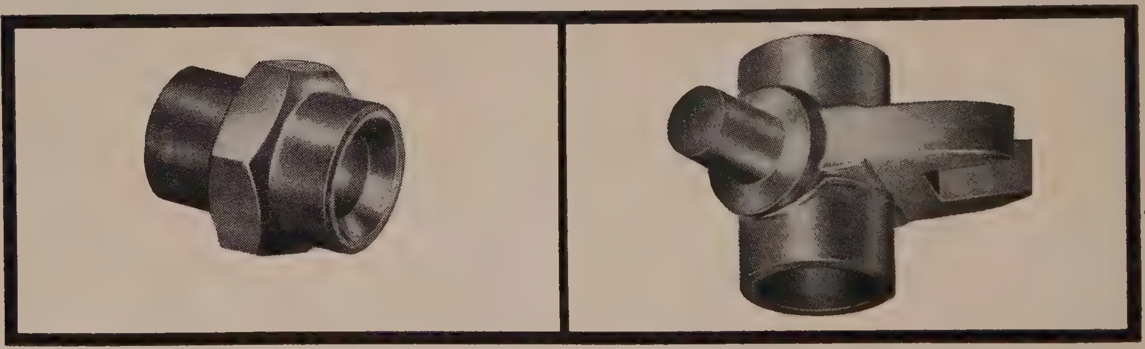

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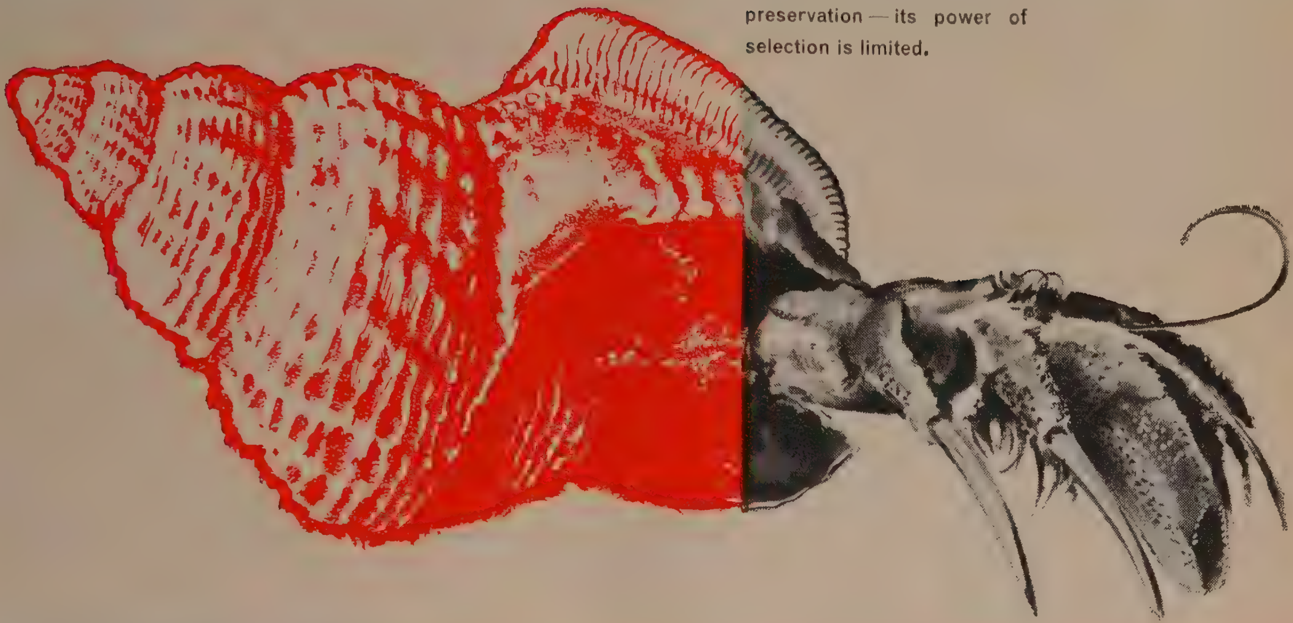

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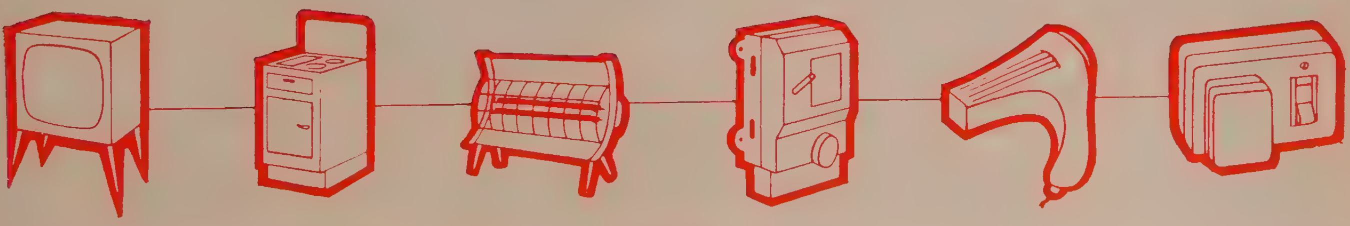

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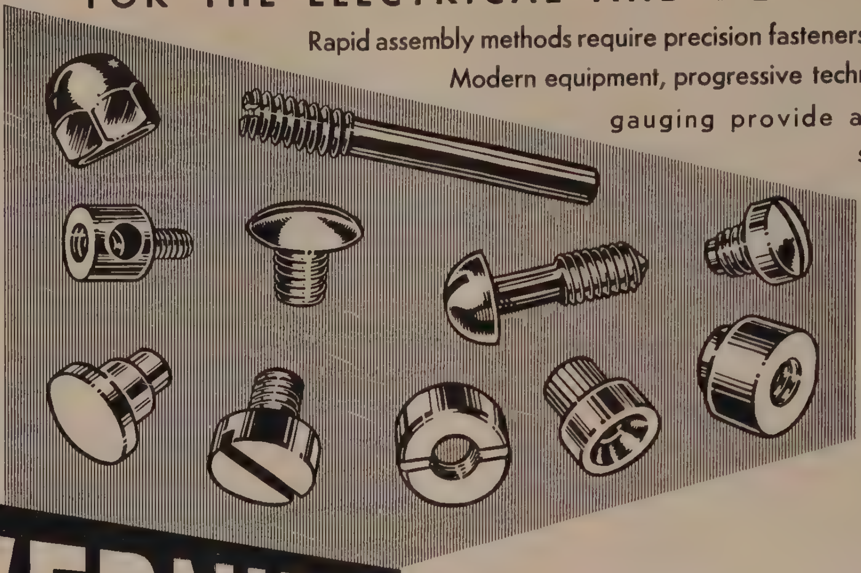

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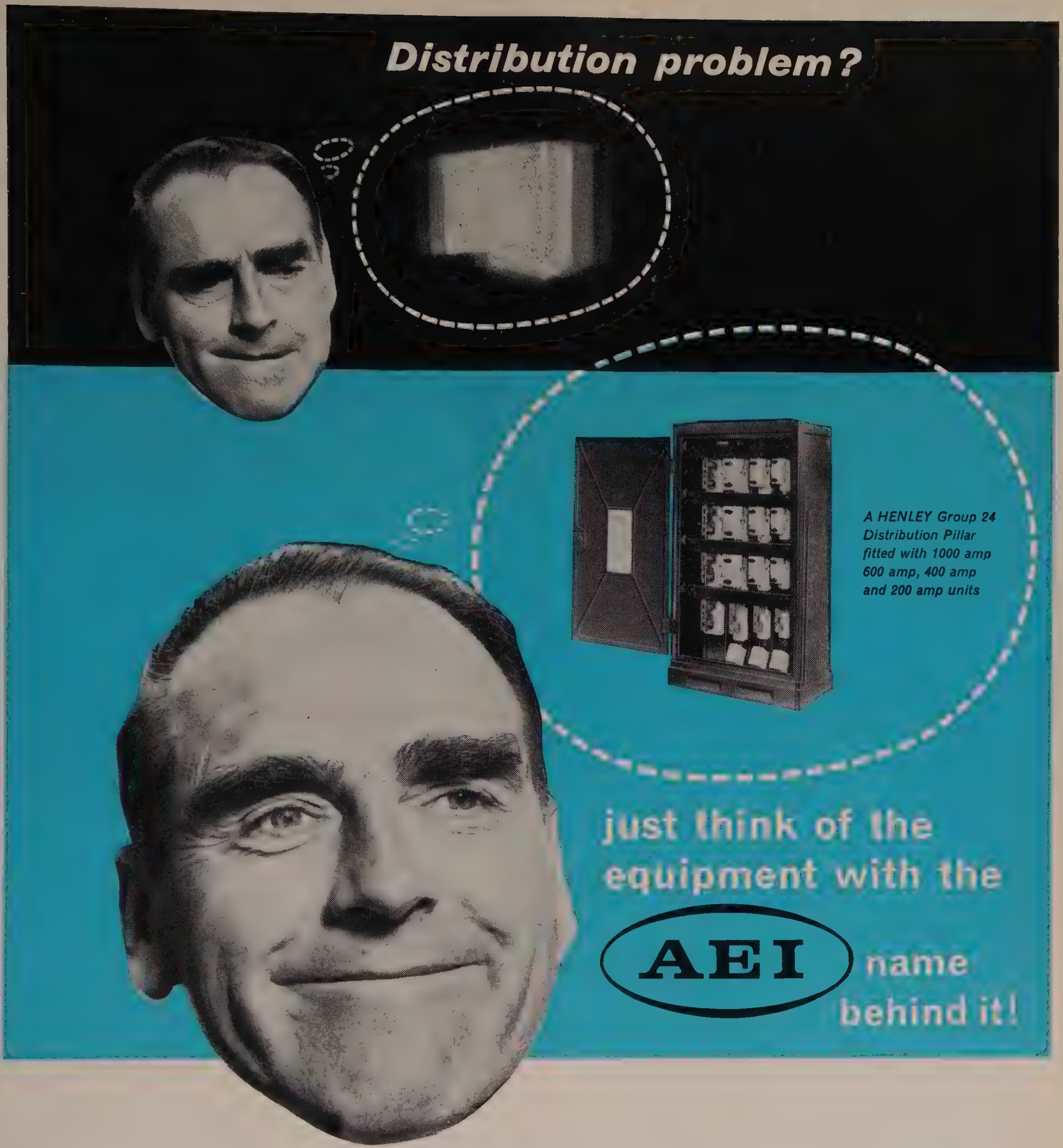

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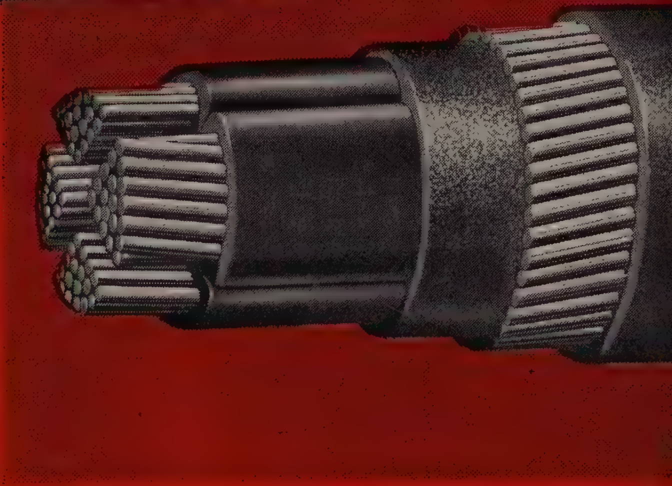

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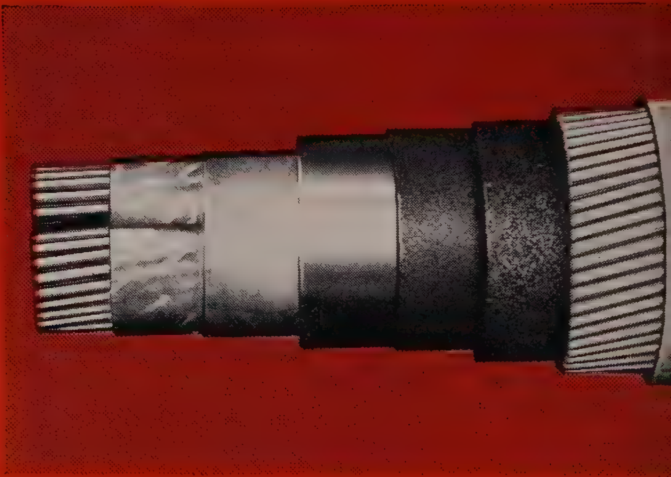

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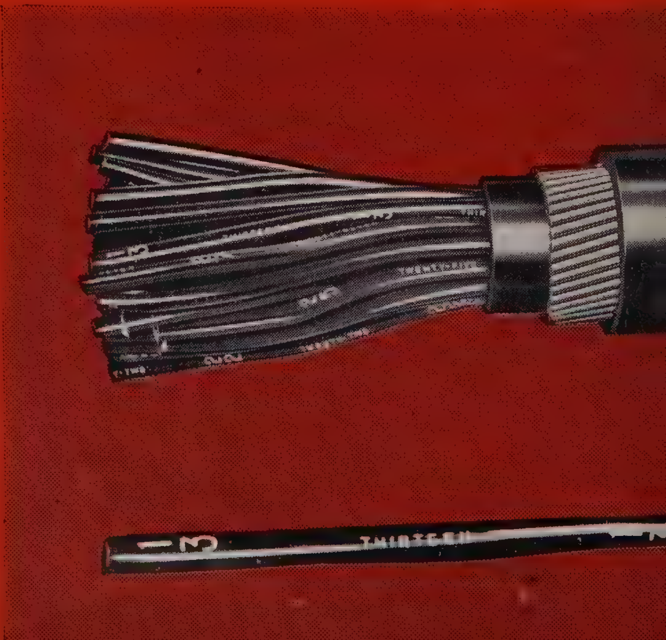

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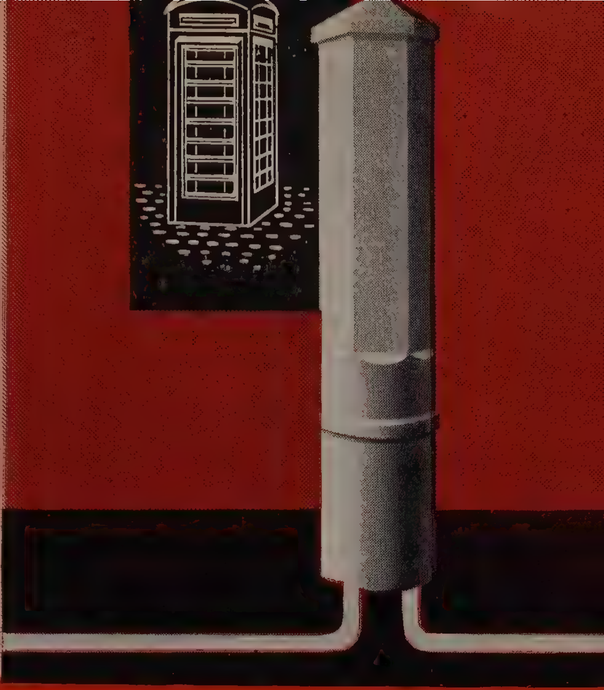

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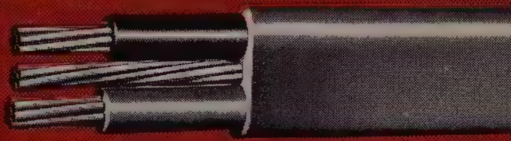

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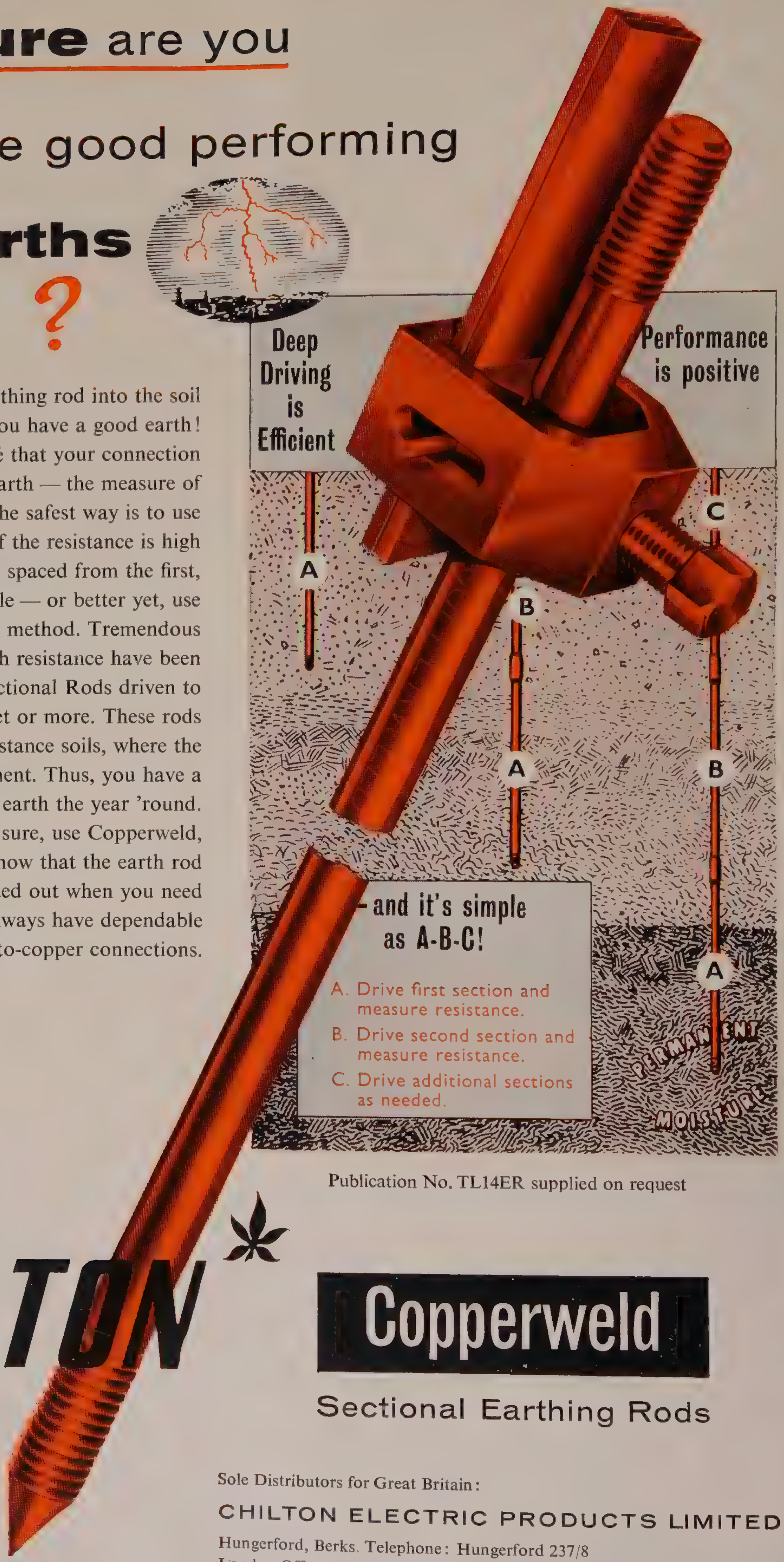

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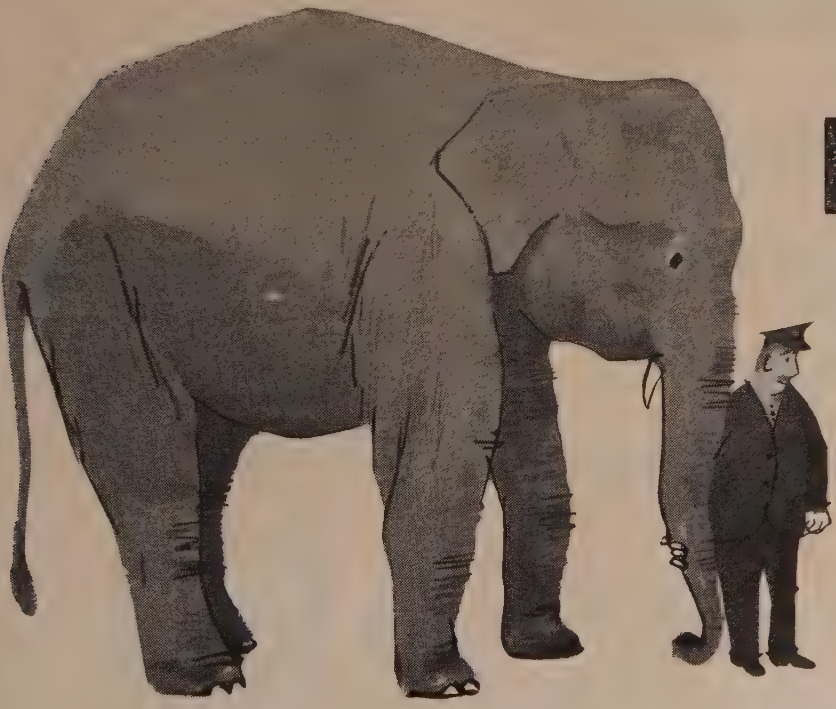

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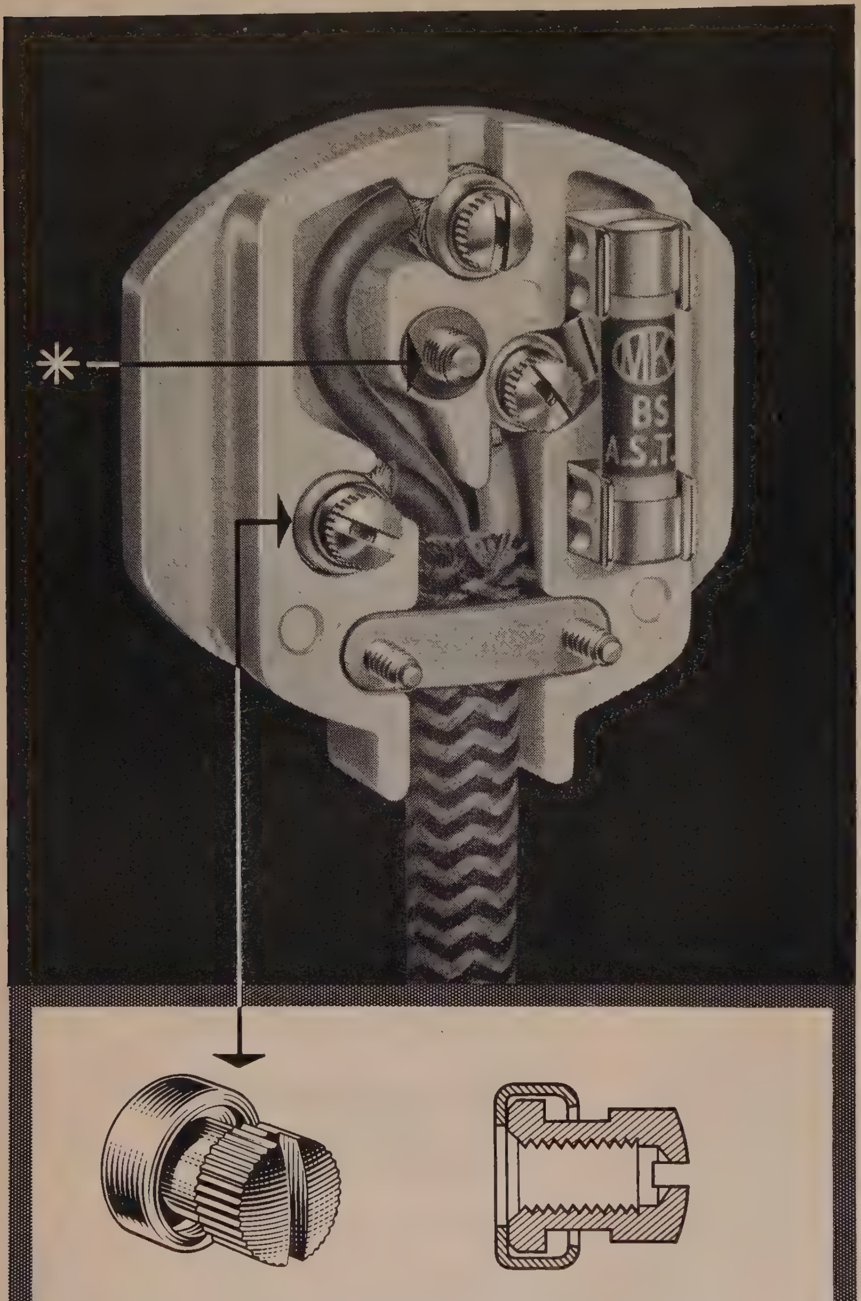

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Selection of Power Station Sites	3	It is shown that, in choosing a suitable site, a large number of different and often conflicting factors have to be taken into account
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New London Theatre	13	The Royalty Theatre, part of a new office block on the site of the old Stoll Theatre, introduces a new principle in stage design
Large Power Systems	15	In this second report of the proceedings at the C.I.G.R.E. meeting in Paris the subjects covered include h.v. cables, a.c. systems, generators, large transformers, circuit-breakers, towers, protection and relaying
U.K. Electrical Trade in May	21	For the second month running, over £1 million worth of generating plant was shipped to Canada in May. Total electrical exports for the month amounted to £20·4 million
Blyth "A" Power Station	23	Officially opened last week, Blyth " A " is the first station equipped with 120 MW sets to be completed. It achieved the highest thermal efficiency of C.E.G.B. stations in 1959

✧ ✧ ✧ ✧

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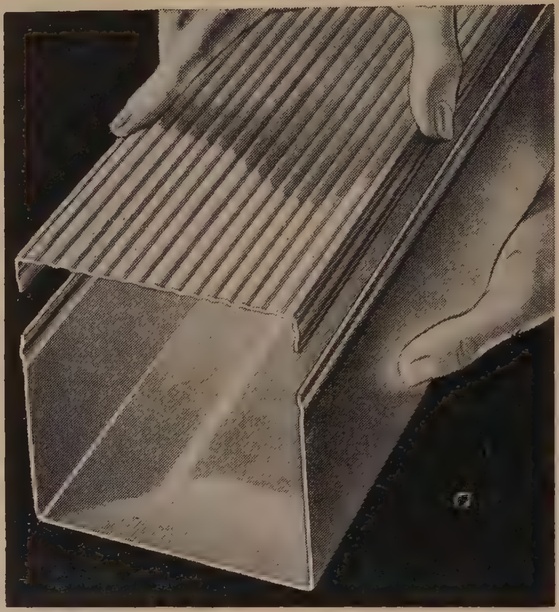

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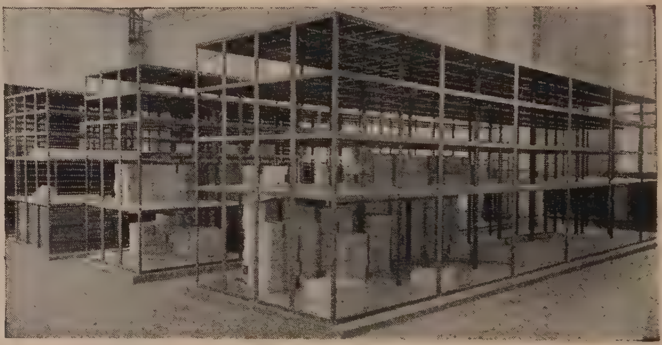

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ELECTRICAL REVIEW

1 July 1960 Vol. 167 No. 1 Established 1872

Modernising Agriculture

OF recent years the need to mechanise agricultural operations as much as possible has received notably more active attention throughout the world than ever before. The problem of purchasing enough food to serve growing populations is, of course, not new. More than a century and a half ago, Malthus forecast the probability that the number of human beings would eventually outstrip the sources of their sustenance. Earlier still, Swift had described a great social benefactor as one who made two ears of corn grow where one had grown before. Since then, however, mechanical means have come to the aid of the farmer in relieving human and animal labour if he is able and willing to make the most of modern scientific methods. Outstanding among these is the flexibility obtainable through the application of power to the numerous items of equipment that lend themselves to individual drives rather than through the use of single steam or oil engines or even the installation of comparatively large multi-purpose electric motors.

As a latecomer among the industries that offered opportunities for electrification, agriculture was at one time apt to be regarded by supply undertakings as a mere appendage to distribution in urban areas which should be content with second-class service. That outlook has been outmoded for many years in this country, where the Area Electricity Boards, backed by the Electrical Development Association, are giving practical demonstrations of the manner in which rural electrification may be made to pay all parties through increased consumption at the higher load factors that owe much to improved diversity in its applications.

This need is also being realised on the Continent of Europe where, according to recent publications of the United Nations, electrification is transforming the possibilities of economic farming, especially where labour is scarce. As in Great Britain, the number of kWh sold to farms is generally growing at a greater rate than that sold for other purposes. A handicap to progress in several countries is said to be the heavy expenditure entailed in reinforcing rural supply systems; this includes the reconstruction of cheap single-phase lines as three-phase distributors with the larger conductors requisite for coping with heavier demands, and this appears to indicate a former lack of appreciation of the importance of electro-farming as a basic social function.

Figures of the number of farms connected seem to be of little more than statistical interest in comparison with the amount of electricity sold to each. The latter provides a truer criterion, but the average farmer, even when well informed of the advantages of electrification, is often forced by circumstances to adopt short-term views by reason of the capital expenditure entailed.

NUCLEAR COLLABORATION

The immediate inducement for collaboration between two nuclear power groups is the saving in time and money that will be achieved by avoiding duplicate tenders. The production of a tender for one of the C.E.G.B.'s stations is said to cost about £250,000, which is no small consideration. Unfortunately agreement to submit a joint tender does not overcome the problem that duplicate engineering teams and research facilities still exist and must be found employment. This clearly has been one of the main difficulties in the long-drawn-out negotiations between the G.E.C.-Simon-Carves Group and Atomic Power Constructions. Even now their cryptic announcement reveals nothing of the form that collaboration will take and, in particular, there is no indication of whether engineering and research effort is to be pooled. Since the two groups are to continue to operate independently overseas this will presumably not be such a complete merger as that being effected between the Nuclear Power Plant Co. and A.E.I.-John Thompson, Ltd.

The losses which the nuclear groups expect to incur fall most heavily on the main electrical partners, who are also experiencing lower profit margins on the larger units of conventional plant now being ordered. Difficulties in the nuclear field may therefore hasten the tendency towards amalgamation in the electrical industry. The multiplicity of important electrical firms in this country is seen by some people as a disadvantage in present conditions, especially in meeting overseas competition. Because of the prestige that the country gains from an export order for a nuclear power station, there would seem to be even greater scope for nuclear collaboration overseas than at home.

GENERATION AT BLYTH "A"

When we visited Blyth " A " generating station some 18 months ago to prepare the illustrated description of the plant published in our 27th February, 1959, issue, the first unit had just been commissioned. On Wednesday of this week, an official opening ceremony took place, the fourth and final set having been put into service on 20th June. The station is the first to be completed in this country with 120 MW turbo-generator/boiler units, No. 1 set being the first in commercial operation, and the improvement in thermal operating efficiency expected from the use of larger units has been realised. Blyth " A " had the highest average efficiency of the C.E.G.B.'s stations during 1959 with a figure of 33·88 per cent and a clear margin of 1·25 per cent. A low electricity cost might therefore be expected and the total works cost is at the commendable level of 0·36d per kWh. This is due in part, however, to the low fuel transport costs resulting from the close proximity of the station to the mines from which its coal is obtained.

A not inconsiderable part of the capital cost of a generating station occurs in providing adequate but necessary reserve capacity for its services. Blyth, for example, has been provided with coal storage facilities for 900,000 tons on a 57-acre site. This is not excessive, since the combined " A " and " B " stations will ultimately have an annual consumption of nearly 5 million tons. The fuel has an ash content of 20-23 per cent and an extensive ash handling plant is necessary. Original plans envisaged direct discharge from sluices into the North Sea but this was not accepted. The installation now includes a dock from which barges take the ash and dust for dumping at sea.

RESTRICTED CREDIT

When announcing his further measures to restrict credit, including a rise to 6 per cent in the Bank rate, the Chancellor of the Exchequer spoke of holding investment in the " public sector " at current levels. From his speech it is legitimate to infer that the quoted phrase applied mainly to the nationalised industries and services and not to general Government expenditure. It thus appears that investment in productive, revenue-earning undertakings is to be " pegged " (while more will be paid for it) while the vast unremunerative Government expenditure will proceed unchecked.

In the " private sector " the increase in the Bank rate will mean either the reduction of capital expenditure (which is what the Chancellor aims at) or the raising of money at a higher rate where expenditure is essential. As discrimination between essential and avoidable expenditure seems to be impossible without other than purely financial control, companies engaged in export business will be saddled with higher costs and a deterioration in their ability to compete in overseas markets. We have complained on previous occasions of the lack of practical encouragement for exporters, although there has been plenty of exhortation; the new restrictions are a further discouragement.

ENGINEERING WAGES CLAIM

As was anticipated, last week's conference of the Confederation of Shipbuilding and Engineering Unions decided to demand an all-round increase in wages in the engineering industry. The claim is based mainly on the contention that production has increased at a greater rate than wages. It is thus suggested that the improvement is attributable entirely (or mainly) to extra effort by the operatives whereas the fact is that a great deal of it has been due to better equipment and methods, which have cost money to introduce.

It was said at the conference that the increase could easily be met from the higher profits of engineering concerns but the records show that some firms have experienced a decline in profits and most of them are becoming anxious about their competitive position in overseas markets. An amendment to the resolution sought to confine the application to higher wages for the lower-paid workers (who probably have grounds for a claim) but this was heavily defeated.

A hydro-electric project in Ceylon

The various factors to be considered in selecting a site for a power station are discussed, including initial cost, distance from solid fuel resources, availability of water for cooling, site access, ash disposal, nature of soil, water levels of sea and rivers and distances from load centres

SELECTION OF POWER STATION SITES

By F. H. DICKINSON, M.Eng., M.I.C.E., M.I.Mech.E., M.I.E.E.*

IN its widest sense, the general problem of the selection of suitable and economic sites for the establishment of electricity generating stations embraces nowadays something beyond the investigation of the purely local features determining the optimum situation to meet the conditions and requirements within a comparatively limited region. Two significant tendencies are becoming increasingly evident, both of which substantially add to the complexity of the problem.

The first of these is brought about by the fact that the enormous development of electricity supply throughout the world in the last few decades has resulted in the continuous and relatively rapid using up of virtually all of what may be called the more obviously suitable situations reasonably adjacent to actual or potential load demands. The sociological aspect is also having an increasing effect in that siting of power stations in the more densely populated areas is now virtually prohibited, and even in sparsely populated zones the growing consciousness of amenity considerations is stiffening resistance to siting power stations in a large number of situations which otherwise would be available. In many cases, therefore, it is now necessary to seek further afield for those sites possessing special attributes where unusual natural advantages can only be brought into effective economic use in conjunction with large-scale industrialisation or other schemes instituted within reasonable transmission distance of the selected sites; or, alternatively, where the growing magnitude of load makes feasible consideration of relatively high-voltage long-distance transmission to already established supply areas, possibly in combination with the replacement of other existing and less economic generating plant. Two present examples of this type of situation are the Kariba Development in Rhodesia and the very extensive hydro-electric potential existing in the South Island of New Zealand.

Although this aspect applies more particularly to the development of hydro-electric resources where the optimum location is determined by natural features occurring at their best only in specially favoured places, it is becoming increasingly a consideration in the choice of sites for some other types of generating plant. This is particularly so in the United Kingdom in respect of thermal plants which can no longer be situated at load centres, although the difficulties this would otherwise entail have been largely offset by the development of the national grid in this country, which has made it possible to consider sites that, without this development, would have had to be rejected on economic grounds.

Effect of Nuclear Programme

The second of the two tendencies referred to above, is to look to an increasing extent towards the future effect of nuclear power in the ultimate economy of long-term planning on hitherto more conventional lines. At present the number of nuclear installations is relatively small, but as the various economic factors involved become more precisely defined the incidence of this type of equipment will have a growing impact upon the general problem. The optimum siting of such plant, as well as involving factors common to the siting of conventional plant, brings into being a whole range of additional difficulties concerned with radiation hazard.

It is possible here to deal only broadly with the general aspects of this problem, but it will be of advantage to examine briefly some of the considerations leading to the necessity to choose a site in a particular locality.

---

* Mr. Dickinson is with Messrs. Preece, Cardew & Rider.

Interior of a diesel-oil power station in the West Indies

These are clearly conditional upon natural availability and are bound up in the general question of power requirements.

The need for power having arisen in a particular area, estimates have to be made, both in terms of maximum demand and load factor, of the requirements not only at the time the new means of supply will come into commission, but for at least ten years thereafter.

Natural Resources

Since the exploitation of natural power sources such as water or geothermal steam can, under appropriate circumstances, provide power more cheaply than by the consumption of fuel, any such resources must be carefully examined. However, the initial cost of harnessing natural resources is usually large, and although such sources may exist in any particular situation, their deployment for the situation in hand may not be the most economic method of meeting requirements. For example, considerable water power may be available, but it is often too far from the source of load to permit economic transmission, or the engineering cost of harnessing the power may be so great as to render it unremunerative. Alternatively, a suitable power source may be available within reasonable transmission distance, but of such dimensions as to be uneconomic at the power level required. A typical instance of this is the Volta River Project in Ghana which is capable of producing at least 1,000 MW; but the initial cost of the necessary dam on a river of this magnitude has hitherto been too great in relation to the power revenue earning capacity within the area. A proposal is now under active consideration to combine development of this water power source with aluminium smelting which requires cheap and abundant electric power. If this scheme is implemented, the project would be able to provide economically considerable quantities of electricity for public supply.

Assuming, however, the availability of economic hydro-electric potential, the problem will centre upon an endeavour to make the best use of a specified water facility and it will generally be found that several different schemes are possible and a number of variants of each must be considered. It will usually be advantageous if the project work can be made divisible into stages, phased in time to accord with growing electricity requirements. The water quantity available will vary during different times of the year and from year to year, and this will entail considerations of storage capacity. The minimum water flow may be only a small fraction of the mean annual flow and the storage capacity required can thus be very considerable. The demand for electricity is also unlikely to be constant and variations, both daily and seasonal, must be taken into account. In extreme cases the minimum water flow at times is zero whilst at other times considerable quantities of water come down over relatively short periods of a year.

Once the data are known it will be possible to determine the desirable storage requirement, but this may be very large indeed and can well exceed what is possible or even economically practicable. Surveys must be made of possible dam and reservoir sites and their capabilities and economic potentialities assessed. It will be obvious that on any site the higher a dam can be raised the more power can be obtained from a given quantity of water, and the greater the quantity of water which can be stored above it.

However, the nature of the terrain will ultimately set a limit at any site to the practicable height of a dam and also to the water pressure that can safely be applied, and the latter may well be lower than the physical contours would otherwise permit. Each potential scheme with all its possible variants and phased stages must be evaluated not only in terms of intrinsic worth, but of the incidence of each upon the system to which it will be connected, and then the problem becomes one of very considerable complexity.

It must also be borne in mind that the construction of a dam and the impounding of a large mass of water in effect produces permanent flooding of the upstream watercourse, possibly for many miles. In uninhabited country this may not be of importance, but even in sparsely populated zones problems of resettlement can assume considerable proportions. Mineral rights and timber reserves may also be affected and in some instances abroad local population in surrounding areas may be affected indirectly by loss of grazing ground or hunting facilities. The effect of water control on the downstream sections of the watercourse must also be carefully studied since, although in general the effect is usually beneficial in tending to even out the flow and to reduce floods, this is not always so as in the case of the Nile where removal of the flood condition would by itself have had a disastrous effect upon the agricultural land in the lower reaches which depends for its fertility on the annual inundation. If the river in question carries appreciable quantities of suspended matter silting can involve serious difficulties. Silt will tend to collect on the upstream side of the dam and facilities may have to be incorporated in the design for clearing this periodically, whilst on the downstream side regulation of the flow may bring about undesirable deposits particularly in the lower reaches, and flooding may tend to develop in the course of years although the maximum flow has been reduced.

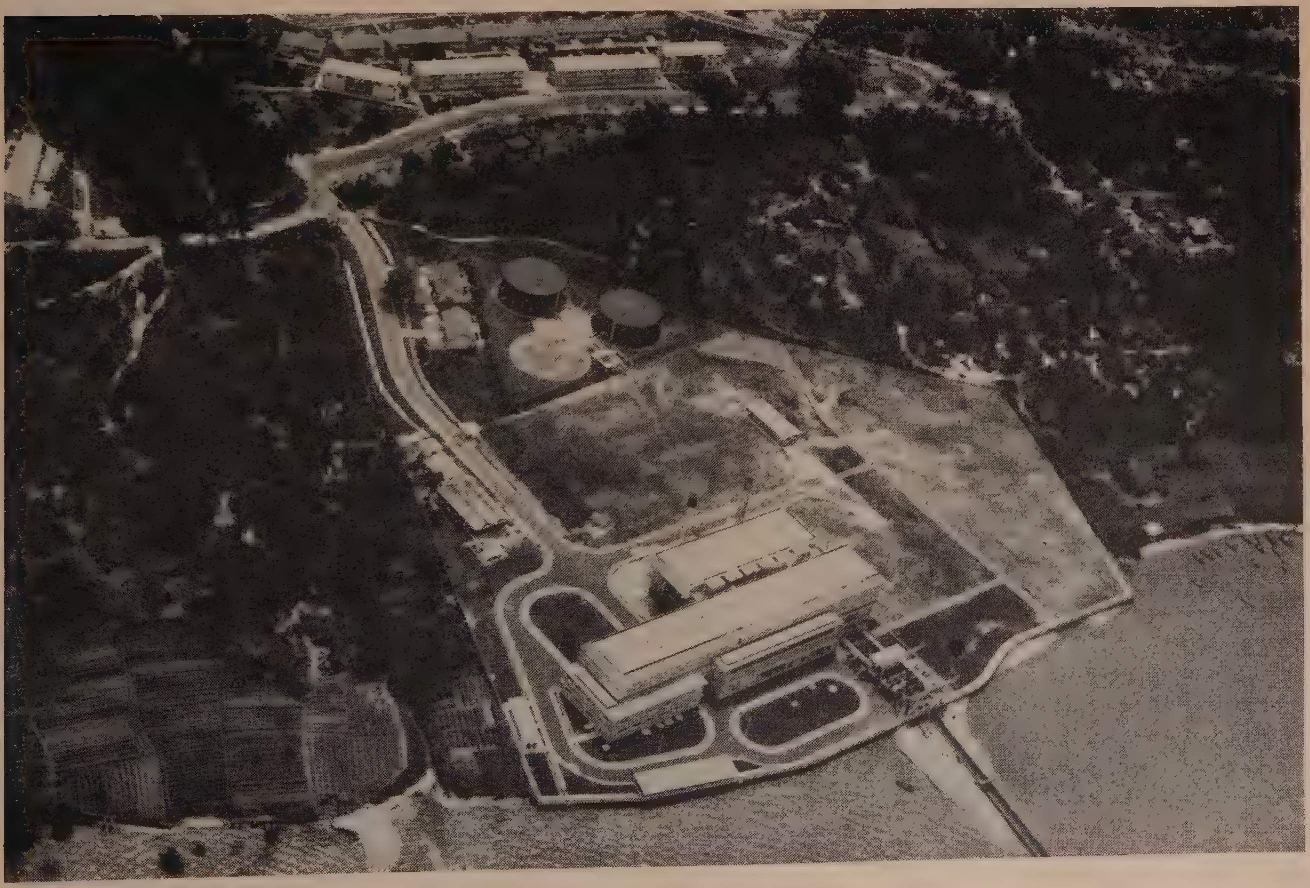
The building of a dam may also have a serious effect upon the fish population. In terms of fishing rights the downstream effect is seldom other than beneficial in the sense that increase in minimum flow and reduced flooding will generally tend to improve conditions, both for fish and fishers, but certain types of fish, notably salmon, may be prevented from passing freely between the sea and their spawning grounds in the upper reaches, and thus would be eliminated altogether. It is sometimes necessary, therefore, to provide elaborate and expensive arrangements to enable this kind of fish population to survive, as, for instance, in Scotland, and it may also be necessary to arrange for a certain minimum run-off to be provided quite irrespective of the needs for electricity generation. In British Columbia, where salmon fishing has developed into a major industry, several rivers, important from a hydro-electric point of view, have so far remained untapped because it has not yet proved possible to devise a foolproof scheme which can be guaranteed not to affect the continued existence of the fish.

Fuel-Burning Stations

If the power requirements of an area under consideration cannot be met from natural sources the merits of different types of fuel-burning equipment must be considered and the availability of fuel will have a decisive influence upon the situation chosen for the power station. It sometimes happens that suitable and sufficient local fuel resources are available in the area requiring power and the use of natural water, if available, or cooling towers if not, will enable a satisfactory site to be chosen without undue difficulty. More usually, if indigenous fuel is available it is to be had some distance from the load centre and the merits of fuel transport *vis-à-vis* transmission must be investigated.

As there is generally more than one practicable mode of dealing with either medium, considerable investigation is required to achieve a satisfactory economic solution. The possible advantages of imported fuel must also be considered in this context and any of these factors may have a decisive influence upon the site eventually chosen. It must be appreciated in this connection that the existence of abundant oil deposits does not necessarily simplify the fuel problem. Crude oil is neither a satisfactory nor an economic fuel, and unless refinery capacity is also available the existence of the deposits by themselves is of little assistance. However, a natural concomitant of

An oil-fired steam station in Malaya with staff housing estate



oil is gas and if a surplus of this is available, as in many oilfields, a radical change may be brought about in the whole fuel situation of a country or even a continent as in Canada and America at the present time where the transport of this fuel is proving economic over distances greater than 1,000 miles.

Consideration of what may be regarded as the basic data of the situation, that is to say, the natural and the fuel resources in relation to power demand, will lead to a requirement for the establishment of a particular type of power plant in a definite locality and it will then be necessary to consider in more detail the conflicting claims of individual sites. In this respect, in addition to the major items already mentioned briefly, a number of other minor but nonetheless essential matters must be taken into account.

Access to Site

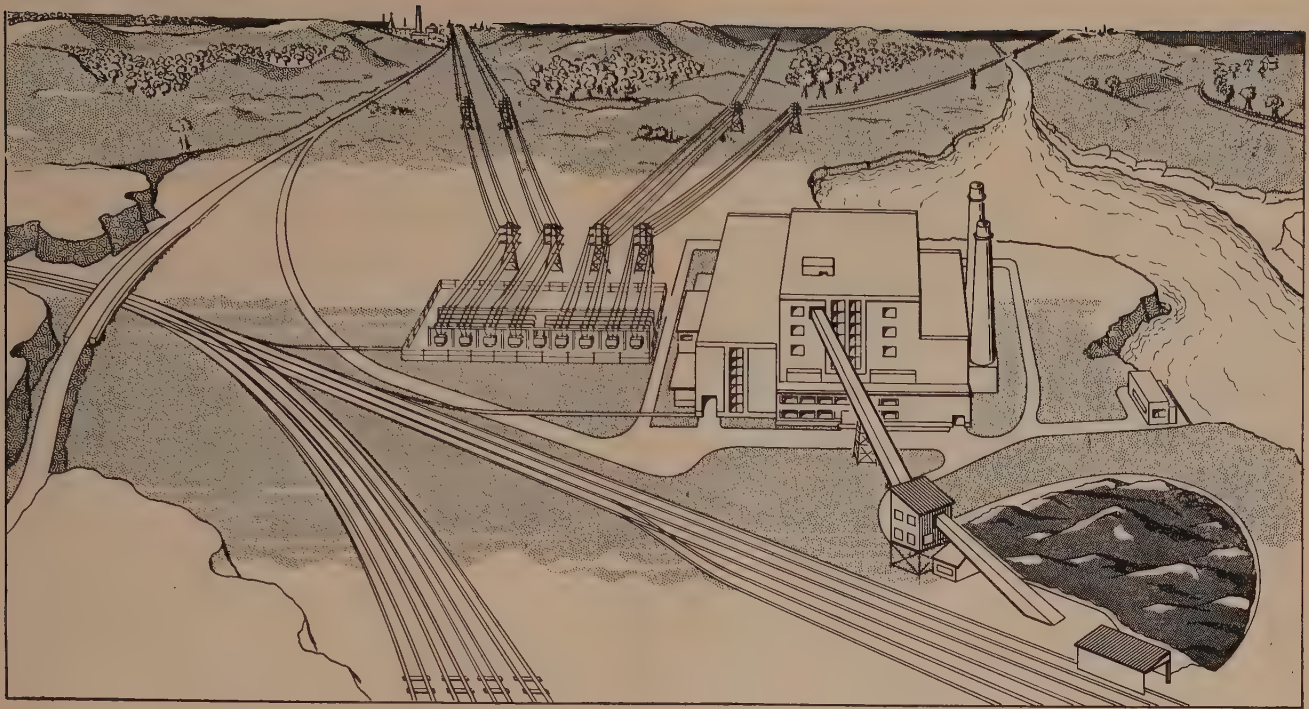
Of these, access is extremely important and some estimate of requirements in terms of the overall tonnage of material and the physical size and weight of the larger components must be made. Except in special circumstances the problem of access is rarely critical, and in the sense that it is easier to arrange at some sites, but relatively difficult at others, it becomes simply a matter of cost evaluation. Provided no major obstacle is discovered requiring detailed study, it is sufficient to ascertain in each case particulars of any work needed to give the necessary facilities. In this connection it should be noted that convenient railway access may be an advantage but is rarely essential. The great strides made in recent years in the development of road transport now make possible economic delivery by this means of almost every type of equipment and with increased flexibility. However, if large quantities of solid fuel are required, rail transport will probably prove to have overriding advantages and if rail access is provided for this purpose it may be convenient to extend its use to movement of the power plant.

Power stations fired by solid fuel can sometimes present serious problems in respect of ash disposal, which may have considerable influence in choosing a suitable site. For many years great effort has been devoted towards the development of processes by which power station ash, both from stoker and pulverised fuel boilers, can be used as a building material, and although some success has been achieved it is still necessary to consider the disposal of a very substantial surplus. The cost of removal of the large quantities of material involved to some acceptable dumping ground, possibly some distance from the site, is obviously a matter of importance in deciding its location, and careful thought must be given to amenity considerations both during transport and on the dump, in the provision of an acceptable method of handling.

The nature of the ground must also be considered, not only on the site of the actual station, but in the surrounding area. The space requirements on a site during construction involve an area much greater than that which will finally be occupied by the finished works. In many instances the optimum area is not available and special measures regarding plant scheduling and storage must be instituted. Prefabrication of a greater proportion of the equipment in the manufacturer's works can assist in this way, but a certain minimum is an essential requirement. It will be safe to assume that any reduction from the optimum requirement will lead to increase in cost and possibly in time of construction. It must be borne in mind in connection with isolated situations, particularly on work abroad, that it may be necessary to build a construction camp at the site for the use of the people who will be required to build the station. In such cases it will probably equally be necessary to allow for permanent housing for the eventual operating staff. This accommodation need not be on the power station site itself, but it must be available in the reasonably immediate vicinity, and amenity considerations will play an important part in the selection of a suitable situation. The needs for this purpose in the case of a large station required to be built in minimum time as is the present-day custom, may well necessitate provision of an area many times that needed for the whole of the power station itself.

Some preliminary assessment of the suitability of each site from a civil engineering point of view must be made with a view to ascertaining the general extent and type of work which will be required, together with some estimation of overall cost. In populated areas it will usually be found that geological information of some kind can be found from previously made surveys. In certain

A coal-fired steam power station approaching completion in New Zealand



Hypothetical solid-fuel fired thermal power station illustrating the integration of the various conflicting plant requirements with the geographical features of the site

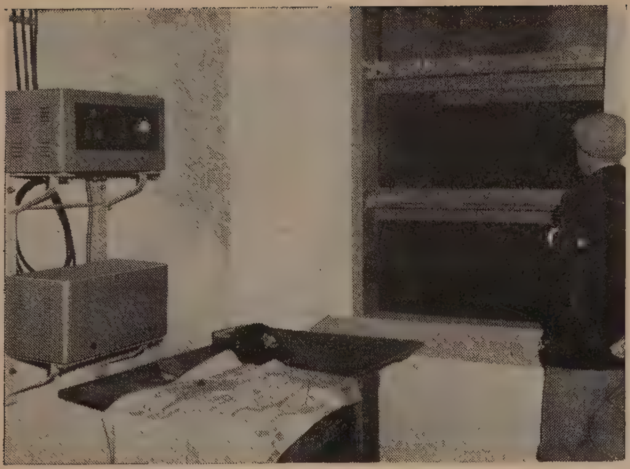
cases this is the result of careful and accurate work from which it will be possible to obtain quite an adequate picture of the situation below ground level. In many other cases, particularly abroad, no accurate information exists and dependence must be upon local observations. Aerial photographs viewed through stereoscopic eyepieces can be of considerable assistance in assessing the probable nature of the territory when used in conjunction with other data which may be obtained from examination of any cuttings which may have been driven in the vicinity, river banks and other natural features. It will usually prove possible to arrange for trial holes and simple loading tests to be carried out quickly. Particular attention must be paid to areas in which deep excavations will be required as in the case of water culverts or low-level foundations, and careful examination must be made for the possibility of anything in the nature of strata of organic origin, soft clays, uncompacted material, running sand, etc., as any of these may well require the institution of special measures and, therefore, of additional cost in carrying out the construction work.

Drainage

Considerations of flooding in the area by reason of lack of natural drainage or by overflow from rivers or other waterways in the area is also most important, and it is sometimes extremely difficult to obtain information on such matters, as accurate records are seldom kept for the situations of particular interest. Useful evidence can sometimes be obtained from examination of permanent watercourses, but is often indeterminate. Information can at times be given by local residents of long standing by reference to prominent landmarks, but this also should be treated with reserve. The situation regarding maximum and minimum water levels will generally only be critical where large quantities of natural water are required for cooling purposes, as in certain types of steam power stations. Such a station involves special difficulty in that it must be sited at a level sufficiently high to prevent flooding and as low as possible to minimise the energy required in pumping. This type of station, however, must in the nature of things be situated near some reasonably large body of water about which it is often possible to discover sufficient information which may be relied upon. For instance, charts are available giving remarkably accurate information regarding the behaviour of the sea in almost all parts of the world. These are of great assistance where marine waters are involved, and the characteristics of the larger rivers are usually also fairly well known. However, it sometimes happens with regard to small rivers, that virtually no dependable data relating either to flow or level are to be had, and it is then necessary to proceed with extreme caution. Arrangements must be made for the taking of observations as quickly as possible and, although these will of necessity be subject to a wide margin of error, they will afford some idea of the limitations to be met. In such cases it is desirable to adapt the design chosen for the works to a form allowing the maximum flexibility in the criteria rather than to adopt a possibly more streamlined but relatively less flexible arrangement. By this means advantage can be taken of the additional observation data obtained during the initial design, tendering and adjudication period and this may well go some distance to confirm or modify the original conception.

The situation regarding the transmission of the output from the station and the injection of this into the existing system must also be considered. This aspect is unlikely to prove critical and it is generally possible to arrive at a reasonably accurate estimate of the costs to be expected in any particular case.

It must also be borne in mind when considering any



It is sometimes necessary to provide elaborate and expensive arrangements to enable the fish population to survive. Fish ladder at Shin hydro-electric station in Scotland

particular situation that numerous different practicable arrangements of the plant on the site will probably be available and some will prove more economically suitable than others. Complete optimisation of a particular site cannot be achieved without considerable study, but in respect of the effect upon the selection of a site it is necessary to have proceeded far enough to be assured that any further benefits obtained from completion of the study will not affect the relative order of merit of the site in relation to others.

It will be seen that the problems of site selection increase in difficulty according to the extent to which it becomes necessary to make use of the natural features of the situation. On the one hand, hydro-electric plants owe their existence entirely to the fact that natural facilities are available and similar considerations apply equally to the use of geothermal features. On the other hand, diesel or gas turbine plant is hardly at all concerned with its natural environment and can be constructed virtually in almost any situation. In between what may be regarded as the extreme limits are the large range of steam-driven plants in which natural facilities have a major but not necessarily overriding influence, and in this category a distinction must be made between stations employing cooling towers and those using sea or other natural water on a once-through basis. In the case of natural water the range of surface level is an established fact and economic factors make it important for the movement through the system of the considerable quantities involved, to take place with minimum variation from this level. This implies that the levels of the pumps, condensers, culverts and piping become virtually fixed within a few feet by the natural water level.

Since many other factors in the design of the station have an intimate relationship with the position of such essential parts a major problem exists. When cooling towers are used this particular difficulty is resolved more easily because although the relationship between water level and the circulating system generally must be preserved in the same way, a suitable level for the water system may be chosen more or less independently of any natural water level in the vicinity. Cases sometimes occur in which it is desired to supplement the use of natural water facilities with cooling towers and the problem is then intensified by reason of the fact that not only have all the requirements pertaining to the use of natural cooling water to be satisfied, but in addition suitable positions at appropriate levels must be made available for the cooling towers themselves. A large station using supplemental natural draught towers may well present formidable difficulty in this respect. The type of use and quantity of water required may present, therefore, in addition to all other factors involved, a special problem in siting a power station.

It will thus be apparent that in selecting a suitable site, a large number of different and often conflicting factors have to be taken into account involving, in one or more aspects, almost every branch of engineering. While the ultimate solution must be based upon a careful and exhaustive assessment of all the relevant data, experience and sound judgment can markedly assist in saving both time and money in the investigations. It is usually possible to devise some practicable method of overcoming most of the obstacles likely to be encountered, but the level of cost involved in any particular instance may render it relatively unattractive. In dealing with the various types of problems concerned, experience will suggest appropriate methods of surmounting difficulties, and a working knowledge of the costs likely to be involved with the different alternatives will enable some of these to be discarded as unprofitable. Investigation may thus be concentrated to avoid unproductive effort, but careful judgment is required in retaining for further examination all those alternatives which have some promise, whilst rejecting those which will turn out badly in some major aspect, and it can certainly be said in conclusion that serendipity is nowhere more useful than in selecting a good power station site.

POST OFFICE TV EXPANSION

TO cater for the rapidly increasing telephone and television requirements, the Post Office are planning to enlarge the Museum telephone exchange which houses the London Television Centre.

The centre controls the complex network of post office h.f. cables and radio links which are used to distribute both music and vision signals forming the television programmes. It controls over 100 vision circuits provided by the Post Office for the B.B.C., I.T.A. and programme contractors and the associated 193 music and 276 control lines. It is also responsible for upwards of 400 circuits used by the B.B.C. for sound broadcasts.

With such a complicated network, where a failure might spoil the reception for many viewers, everything possible is done to guard against breakdowns. Elaborate automatic equipment constantly checks the circuits in each station and gives indications in the control centre of any abnormality. Reserve equipment, including standby generating plant, can be switched into service if necessary in stations many miles away by using this apparatus.

The switching of the main line links for the I.T.A., where the inter-city circuits are shared by all the programme companies, is a particular problem as the time available for a complete change of routing is only three seconds. The switching is carried out by electronic equipment called the Automatic Network Distribution Equipment (ANDE) where fifteen sources can be connected to any one or all of fifteen destinations and up to two changes of route can be set up in advance so that they will take place at predetermined times.

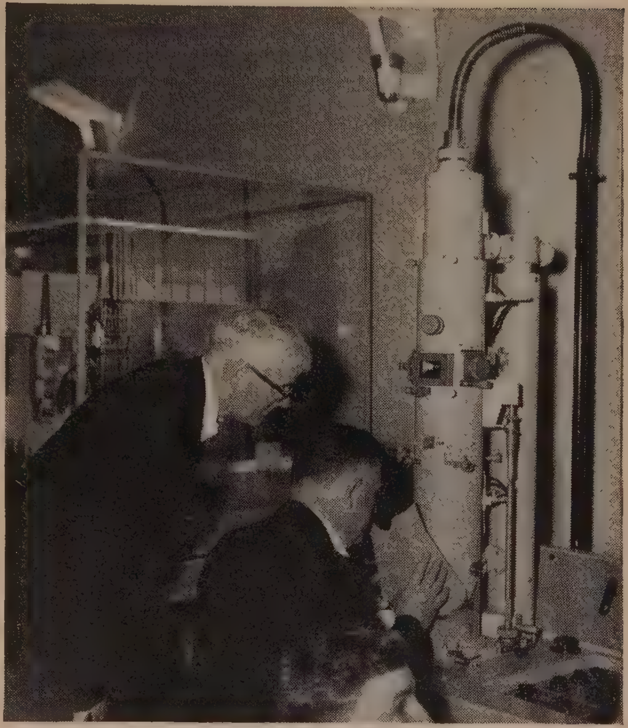
I.E.E. Conversazione

LARGE GATHERING AT ROYAL FESTIVAL HALL

A CONVERSAZIONE, attended by about 2,000 members and guests, was held by the Institution of Electrical Engineers on 23rd June. Because of the success on the two previous occasions, this biennial event was again held at the Royal Festival Hall. Sir Willis Jackson, D.Sc., F.R.S., president, and Lady Jackson, assisted by Sir Hamish D. MacLaren, K.B.E., C.B., D.F.C., LL.D., B.Sc., president-elect, and Lady MacLaren, received the members and guests in the upper foyer.

The programme again included exhibits and demonstrations of electrical engineering interest, concerts in the auditorium and dancing in the foyer. The exhibits, which numbered about 70, included a demonstration of two-speed single-winding squirrel-cage induction motors using the principle of pole-amplitude modulation. This exhibit was contributed by Professor G. H. Rawcliffe. A demonstration of a small battery-driven trolley which automatically followed a white line attracted attention. The mechanical steering arrangement was operated by two photo-transistors through a transistor d.c. amplifier. Exhibits in the heavy current field included a model of a 120 MW turbo-generator for a reheat cycle and actual high-voltage bushing insulators. A model of one of the reactors and heat exchangers for Hinkley Point nuclear power station and a model of the 7 GeV proton synchrotron now being built by the National Institute for Research in Nuclear Science at Harwell, represented nuclear engineering. The application of electricity to industry was well illustrated by a model of a typical reversing steel rolling mill. This exhibit included an animated diagram of the electrical circuits showing the operation of the twin 4,000 h.p. d.c. mill motors. Many of the other exhibits were, however, concerned with the light current field which included a closed-circuit television system, an electron microscope and a transmitting aerial demonstration.

During the evening the concerts given by the orchestra of the Corps of Royal Engineers and the Linden Singers in the auditorium were well attended.



The electron microscope exhibit

Left to right: Lord Chandos, Mrs. C. T. Melling and Mr. C. T. Melling

Left to right: Sir Willis Jackson, Lady MacLaren, Lady Jackson and Sir Hamish D. MacLaren

E.C.A. Scarborough Conference

DISCUSSIONS ON RETAILING AND FLOOR WARMING

Last week we published an account of the annual conference of the Electrical Contractors' Association at Scarborough, making brief reference to the discussions on the two papers which we summarised. This week we give fuller reports of the speakers' contributions

Mr. C. R. Waterhouse is installed as president by Mr. V. J. Stock

THE first paper was that by Mr. N. A. H. Stacey (G.E.C.) on "Retailing—The Future Pattern" and the discussion was opened by Mr. H. S. Wathes (Leicester) who said that he recognised that changes were inevitable but he found it difficult to time the rate at which they would take place. He was pleased that the author regarded conditions as favourable to the small contractor, and the manufacturers should be pleased too. Retailers had no prescriptive right to a share of the available business—only a right to what they earned and reward for what they were prepared to do for themselves.

Mr. Stacey said that the contractor was catering for an expanding market. Because of the number of appliances which had been installed the wiring of many homes was often inadequate. "Double-income" homes were a large future market. With the aid of a little market research retailers could find which class was likely to be most remunerative to them and they should advertise particularly to that class.

Mr. H. F. Truman (Walsall) asked Mr. Stacey why he advocated out-of-town premises and said that local rates and rents were continuing to rise and absorb savings achieved by efficiency. Not enough was spent by contractors on advertising; the Electricity Boards were much keener to obtain customers by live salesmanship. Mr. Stacey thought that the electrical industry failed in putting over information. People should read their trade journals and take them seriously.

Mr. J. D. Johnson (Simplex) said that the paper was an excellent "stick-and-carrot" incentive to contractors. Manufacturers would be very loth to have their marketing in the hands of a few "giants." But the small man could not be protected by the manufacturers from competition, for they had to use the most promising outlets. Ability to advise and local knowledge gave the independent retailer a great advantage over the multiple shops. He also referred to the moves to secure the abolition of retail price maintenance.

Mr. Stacey said that price maintenance was bound up with monopoly and restrictive practices; none of these was good or bad—it depended on the way in which they were operated. Manufacturers' margins were not adequate in comparison with those of wholesalers and retailers. There would be very little saving to customers if price maintenance was abandoned but abolition would benefit the efficient retailer.

Mr. A. Apps (Canterbury) asked for the author's opinion of the groups which were being formed to offer special discounts to the public and had asked electrical retailers and contractors to take part and share their discounts. Mr. Apps also sought advice on advertising.

Mr. Stacey said that the electrical retailer must show that he was more efficient than such groups. "Compound" trading was prevalent and not much could be done about it. The small retailer would find cinema advertising and the use of local newspapers profitable in convincing local people of his ability to provide goods and service.

Mr. G. N. Walker (Birmingham) spoke of the difficulty of meeting rising costs with the fixed margin allowed by manufacturers. Against an average of 28 per cent for the retailer, multiple stores were getting a gross margin of 46·6 per cent which was what the electrical retailer needed if he was to remain in business and provide after-sales service. An alternative was to sell cheap goods which could be discarded at an early stage.

Mr. N. A. H. Stacey presenting his paper on retailing

Mr. Stacey said that the "multiples" did not only enjoy the manufacturers' discounts, they also had remunerative self-financed hire-purchase schemes, they operated economically and had efficient premises. He maintained that no business people in the world were making greater margins than the British. The Americans were investing heavily here because margins were double those in the United States and higher than anywhere in Europe.

Mr. P. B. Etheridge (Electrical Wholesalers' Federation) thought that some of the things recommended in the paper could not be done while retail price maintenance continued. In the United States retail buying groups had not developed so much as they had here. Future emphasis would be on the wholesale group rather than retail. The E.W.F. was studying voluntary groups and chains but it could not yet say whether they were good here or not.

Mr. Stacey said that it was probable that the margins quoted for the United States were net. American methods should be studied to find how far they could be applied here. He agreed that margins should be increased but it should be done through efficiency rather than through manufacturers' discounts. The retailer must study his market as the manufacturer had to. In the future the trade associations must adopt new ways of helping their members, e.g. in advertising, market research and acquainting them with new products.

Floor Warming by Electricity

Mr. F. W. Blanshard (Purley), opening the discussion on Mr. R. D. Jackson's paper, said that the author had made no mention of systems run through holes in concrete formed by the use of rubber tubing. He said that with a 2½in screed it was not easy to ensure uniform coverage for the wiring. It was difficult to get builders to apply the screed in two layers on account of the extra cost. Mr. Blanshard said that in checking the loading of floor warming systems he had found differences up to 10 per cent from the stipulated figure. Wiring for other services could not be run in conduits parallel with the heating wires. He commended the use of three-phase systems but the I.E.E. Regulations would seem to rule out p.v.c.-covered wires for this purpose.

Mr. Jackson said that he would like to see a 3in screed but it was a matter of building costs. As to variations in loading there was no general agreement in this matter. If allowance was made for variations due to air changes it would add nearly 25 per cent to the net hourly load. This uncertainty had led to sizeable installations. So long as a little screed was placed between the services there would be no hot spots in conduits carrying other wiring. Any large installation should be three-phase; plastic-covered cables had been used. In some blocks of flats a direct system as an on-peak load might be cheaper.

Mr. C. King (London), dealing with a number of points, said that non-withdrawable systems with organic type insulation would probably have to be renewed in 25 years. This might militate against the adoption of floor warming. Interior floor temperatures could reach as much as 158°F in certain circumstances and the possibility of overheating the cables should be taken seriously into account. His company would accept responsibility for embedded systems only for the guarantee period. It was possible that ceiling heating, a controllable system, was preferable in some cases, for there was no trouble from carpeting, furniture, etc.

Mr. Jackson said that manufacturers fully guaranteed embedded systems for non-domestic installations but those in dwellings should preferably be withdrawable. Manufacturers of nickel-chrome and other alloy conductors did not admit that there was any deterioration with temperatures as high as 1,000-1,200°C. Ceiling heating could have its advantages in certain buildings but people were more affected by heat from average-height ceilings at 80-85°F than by floor heating.

Mr. A. S. Redvers Pratt said that the idea was to heat people not buildings. He pointed out that natural heating came from the sun overhead. The contractor must have the advice of a competent heating engineer. Ventilation was inextricably bound up with heating. Why heat a whole building when comfort could be obtained by heating the air in the building? Mr. Jackson said that the average air change in a building was 1-1½ an hour. Mechanical ventilation necessitated bringing in warm air. It was not generally agreed that overhead was better than underfoot heating.

Mr. H. Bamber (York) said that for every commercial building about 100 houses were erected so that this was a large potential field. Contractors should aim at providing full, not just background, heating. Mr. Bamber also touched on the question of perimeter insulation. Mr. Jackson said that to give heating at 70-75°F would necessitate higher floor loading. Perimeter insulation was not essential in every case and its cost might not be balanced by the saving in consumption.

Mr. R. D. Jackson, the author of the paper on electric floor warming

Replying to Mr. T. F. Pitts (Bradford), Mr. Jackson said that as far back as 1949 floor warming had been applied to a large existing house, but there were good reasons against using it in old houses and a rewirable system must be used. It involved insulating backboard and notched joists and there was difficulty in maintaining contact with the floor surface. Answering Mr. R. J. Griffin (Leighton Buzzard), he said that there had been no complaints of " dryness " of the air with floor warming. Where there was a concrete ground floor and wood floors above he recommended the use of convectors rather than an embedded wall system although he admitted that such a system could be effective. Mr. C. W. Edwards (London) said that there was no adequate control in small buildings to meet sudden changes of outdoor temperature. Mr. Jackson said that complaints were usually due to underheating but sudden changes were unusual in this country. He agreed that interior temperature fall was subject to a time lag.

Mr. J. Nield (Chester) mentioned a Canadian system in which wires were laid in a special timber on the joists. Mr. H. W. Evans (Doncaster) said that he found floor warming satisfactory for background heating, with a small supplementary heater, and it was reasonable in cost. Direct heating should be considered for churches. Mr. E. A. Cattle (London) said that the author did not say how a floor-warming system could be installed in a multi-storey commercial building with all the other services to be accommodated. Mr. Jackson replied that the problem was not a new one and it had been solved in various ways: for instance, separate floor screeds for the two systems.

VIEWS on the NEWS

By "REFLECTOR"

FINE weather and the attractions of a seaside town contribute to the success of a conference but they often seduce the delegates from the business sessions. Those who went to the E.C.A. conference at Scarborough steeled themselves against the lure of sun and sea and the attendances were good. Of course presence at the opening meeting and the presidential address is obligatory and it might be said (and actually was said) that as Mr. N. A. H. Stacey's subject, the future pattern of retailing, was one which touched upon the making of money—a compelling idea—a good audience was guaranteed. The subject of electric floor warming would not seem to be attractive on a hot June afternoon; nevertheless there was a good gathering to hear Mr. R. D. Jackson present his paper and to contribute to the discussion. The contractors deserve high marks for their attention to business.

* * *

Electricity Boards do certain things which private concerns consider should be done by them and they possess fairly wide powers under the 1947 Act. But there are limits. A Great Yarmouth consumer recently wrote to the local office asking them when he could have his chimney swept—" electric with brush." The Norfolk Sub-Area magazine says that this was something even the Commercial Department was not prepared to quote for. I suppose that it wouldn't, to quote section 2 (4) (b), be included under " all such activities as it may appear to the Board to be requisite, advantageous or convenient for them to carry on for or in connection with the exercise and performance of their functions."

* * *

I still hear of complaints from people living in flats who are charged excessive rates for electricity supplied to them by their landlords, which makes me wonder if any Electricity Board has exercised the power conferred by section 29 (1) of the Electricity Act, 1957, to " publish a notice fixing maximum charges in consideration of which electricity supplied by the Board may be resold by persons to whom it is so supplied." As I have said before, overcharging for electricity by landlords is a handicap to electrical development and as such is as much the concern of the industry as of the consumer.

* * *

Following upon the publication of a report by Messrs. Preece, Cardew & Rider on the proposed Cook Strait cable which would carry power from New Zealand's South Island to the power-short North Island there was a great deal of newspaper comment. Not all of it was favourable to the project; in fact, says *Live Lines* (Wellington) there was " the fantastic suggestion that the country could not afford the luxury of spending £18 million on a cable which ' will not produce one unit of electricity.' " It would be most useful to have a cable which not only transmitted electricity but also generated it.

* * *

Fish and electricity have many links, as I have often pointed out. The latest development in this relationship is reported from Russia by a special correspondent of *The Times* who predicts a shortage of caviar. As he says, one cannot have caviar without a sturgeon and this fish occurs, to the extent of four-fifths of the total, in the Caspian Sea. That sea is getting shallower and shallower and at the same time industrial (mainly oil) effluents are making it more difficult for the sturgeon to live. But where does electricity come in ? Well, on the Volga and other rivers which feed the Caspian a number of hydro-electric stations have been built and combined with these there are irrigation systems and means of supplying water to industry. Consequently the amount of water reaching the Caspian is seriously diminished. A hydro-electric engineer has suggested a plan for diverting the waters of two rivers, at present flowing north to the Arctic Ocean, into the Caspian, thereby redressing the balance upset by him and his colleagues.

* * *

Eighty years ago the *Electrical Review* (1st July, 1880) published some views on the possibilities of electric railways and it was inclined to think that the scope was rather limited. Here are some extracts:—

> " Now that the possibility of an Electric Railway has been fairly put before the public by Dr. Siemens, we may expect to hear more about it before many years. . . . As yet, the new means of locomotion has only been experimented upon on a comparatively small scale, but the results have been quite sufficient to justify a favourable conclusion being drawn. . . . Railways worked by electricity will, however, have to compete with a formidable rival in the shape of railways worked by compressed air locomotives. This latter means of producing locomotion appears to have woke up again and is likely to have considerable employment. For very short distances, where the traffic is heavy and irregular, as, for instance, on the small branch lines used so frequently in mining districts, the electrical railway could be used with great advantage, especially if natural sources of power are available."

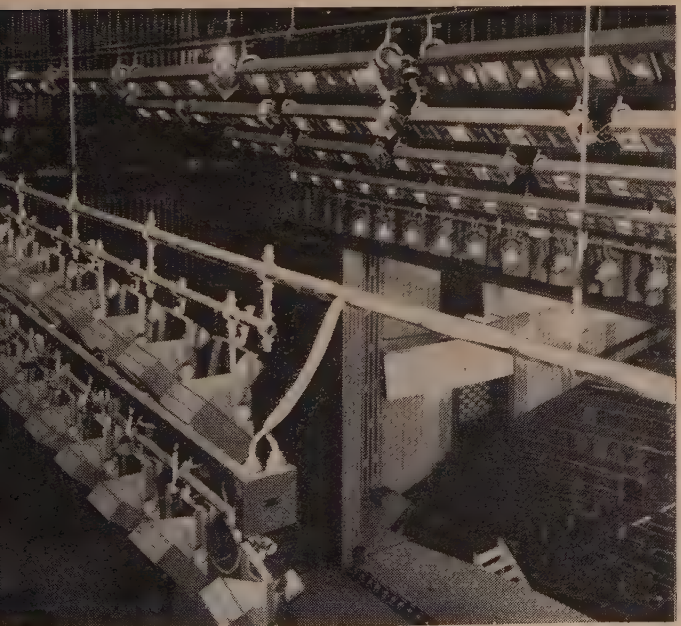
New London Theatre

OPENED on 23rd June, the Royalty Theatre, Kingsway, London, has been constructed as an integral part of a new office block on the site of the old Stoll Theatre. The theatre has a seating capacity for 1,000 on two levels. It forms the base of the new building having the back row of the circle at street level and it introduces a new principle of stage design. The adjustable proscenium opening can be varied in width from 36 to 43ft according to the type of play. The height of the opening is fixed at 20ft and the stage is 33ft deep but an extra 12ft can be obtained by raising the door of the scene dock at the rear, while the orchestra pit is equipped with a lift which can raise it to stage level for service as an apron stage extending 7ft into the auditorium. The footlights, working interdependently with the lift, can be electrically rotated to provide a flush stage level. The grid from which the scenery is suspended is 52ft above the stage and an electric hoist is incorporated to raise and lower the scenery.

Stage Lighting Installation

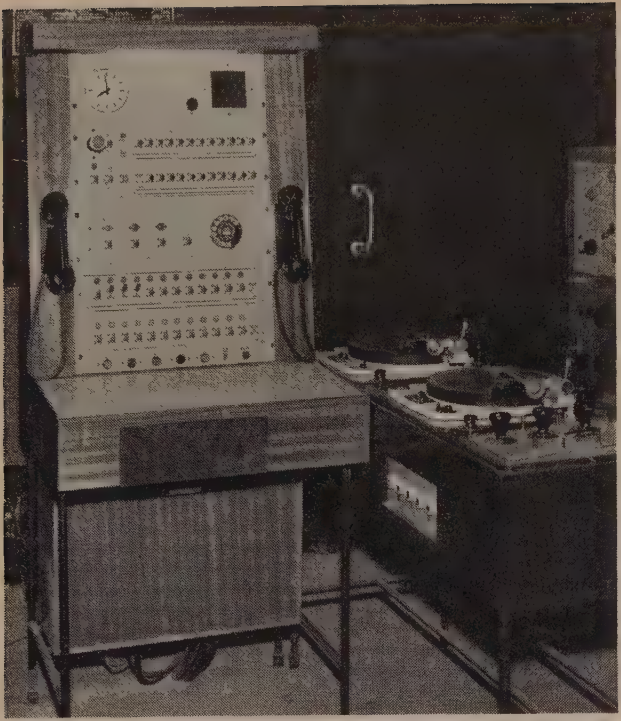
The lanterns, wiring and remote control installations for the stage lighting have been designed to give maximum flexibility. The directional lighting for the acting area is provided by the new 500 and 1,000 W Fresnel spotlights which give a soft-edged beam variable in spread from 15 to 55°. These spots give a beam completely free of filament striation and their efficiency is such that the 500 W version gives more light than a plano-convex lens type with a 1,000 W lamp. Every lantern is connected by a plug and socket, including the battens and the cyclorama flood-bar, so that these dimmer-controlled circuits may be utilised for additional side-lighting. One-third of the 120 servo-operated resistance dimmer circuits terminate in the auditorium. The remote control console is situated at the rear of the circle and used only to change the lighting. Once a change has been completed it is electrically disconnected from the dimmers and the miniature levers pre-set for the next change. No change takes place until a master control is pressed and the console reconnected. Each dimmer is provided with a selector switch on the console and there is a memory device enabling 14 different combinations of these switches to be stored for instant recall. The dimmer banks are housed in a room beneath the stage and have a total load of 240 kW.

A comprehensive system for theatre sound reproduction and communication has been installed. This comprises extensive equipment for sound amplification from



The stage lighting is controlled . . .

.from this console



Loudspeaker intercommunications and cue light systems are controlled from these desks in the "prompt corner"

the stage and special loudspeaker calling and rehearsing equipment. Dialogue can be continuously relayed to dressing rooms and other back-stage areas during performance while a further amplifier system can relay music, dialogue or announcements to all front-of-house areas. Other amplifiers provide for sound effects on or off stage. To provide these facilities, 19 amplifiers, 12 microphones, 41 loudspeakers and over 2,000 yd of cable have been employed.

Features of the house lighting are large four-tier, 30-light chandeliers, one each side of the proscenium, and two-, three- and five-light matching wall brackets. These are all fitted with tungsten lamps having specially shaped filaments. Above the balcony there are 19 reflectors with 300 W lamps recessed in the ceiling and fitted with internal baffles to minimise specular reflection, while there are 10 semi-recessed fittings beneath the balcony. The main house lighting is on dimmer control circuits which can be operated from any one of several points. The central lighting feature in the entrance is a two-tier, 18-light chandelier. Fluorescent lighting has been used for the first time in this country for the make-up mirrors in the dressing rooms. It is provided by "Osram" de-luxe warm white tubes behind glass diffusing panels.

The house telephone system comprises a 50-line automatic exchange and 35 automatic instruments. It can be operated in conjunction with the public address system.

The architects for the theatre were Lewis Solomon, Kaye & Partners, the consulting engineers were John de Bremaeker & Partners and the Phœnix Electrical Co. (London), Ltd., were the electrical engineers. The general contractors were the Token Construction Co., Ltd., and equipment suppliers included:—Stage lighting installation, Strand Electric & Engineering Co., Ltd.; sound amplification systems, Standard Telephones & Cables, Ltd.; main switchgear and decorative lighting fittings and automatic telephone exchange, the General Electric Co., Ltd.

ELECTRICITY IN THE HOME

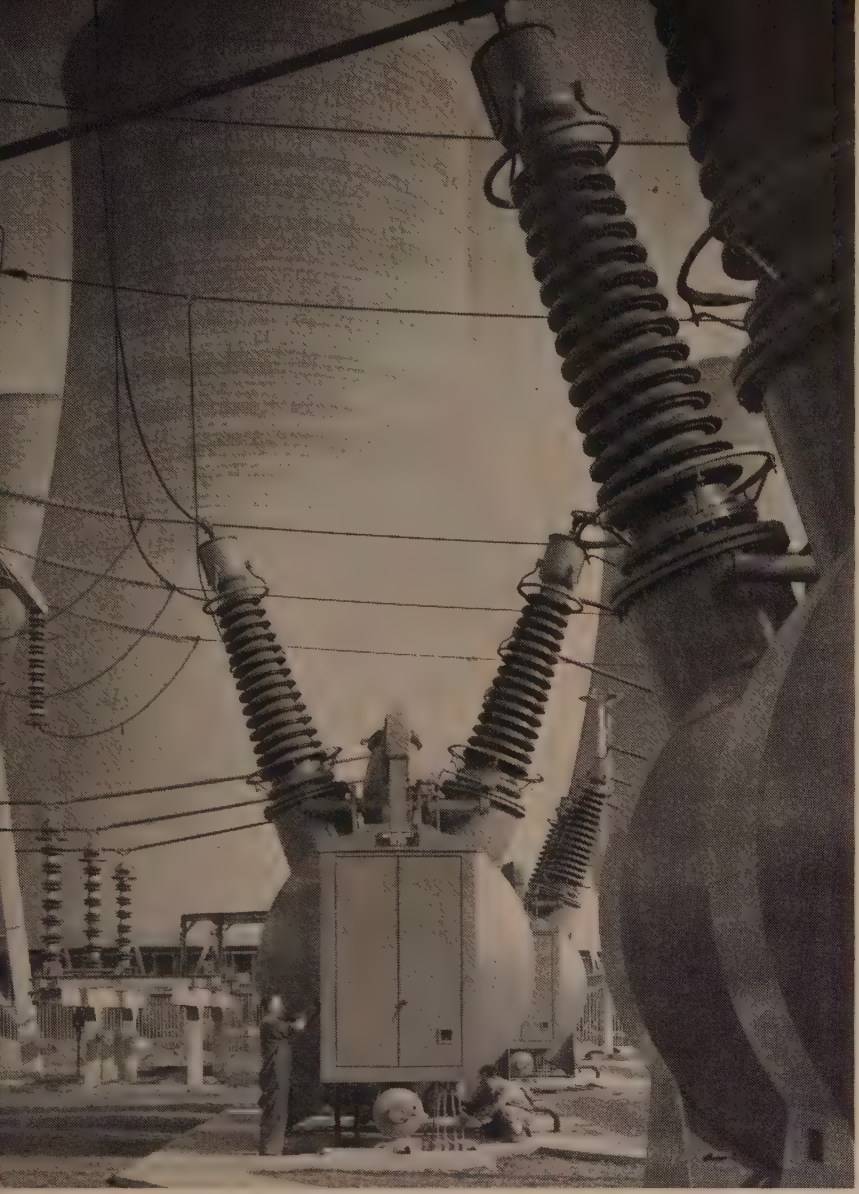
IN submitting its evidence to the Advisory Committee on Housing Standards of the Ministry of Housing and Local Government, the Electrical Contractors' Association concentrated on the necessity for an adequate electrical installation. One or two sockets a room, as recommended in the Ministry's 1949 Housing Manual, was regarded as utterly inadequate.

To cater for both "permanently" and "casually" connected appliances the E.C.A. recommended the installation of socket-outlets on the following scale: hall and landing, 1-3; living room, 6-10; double bedroom, 5-8; single bedroom, 3-5; kitchen utility room, 6-8; garage, 1-3.

Even so, they stated, these figures already fall below the optimum required. The E.C.A. emphasised that an adequate provision for socket-outlets is not a luxury but is essential if the fullest benefits are to be gained from labour-saving appliances. Moreover, a multiplicity of outlets will avoid accidents caused by the use of long cords. If an adequate installation is provided in the first place, there is less temptation for the householder to try to improve it, and to make "temporary" extensions. The convenience of electric heating at the touch of a switch makes it very desirable, and the provision of adequate socket-outlets would enable the lower income groups to enjoy the benefits of electric heating without the necessity of a large capital expenditure on built-in heating systems, which could be relatively expensive to run.

In answer to a question about the possible demand for whole-house heating systems in the future, the E.C.A. reminded the Committee that the demand for centrally heated houses is spreading rapidly, and that the additional capital cost in respect of electric whole-house heating is very small, compared with that of systems using combustible fuels. A suggestion that laundry facilities should be provided in the bathroom was strongly condemned. The Association also stressed the necessity for adequate lighting, not only as a means of illumination, but also as part of the interior decoration of the modern home.

In answer to a request for suggestions for recommendations for safety, the E.C.A. listed the following points :—All socket-outlets should be three-pin, shuttered and preferably switched; all wiring systems should be concealed; there should be no provision for portable appliances to be used in bathrooms (with the exception of a shaver socket-outlet to B.S. 3052); lighting points in halls, landings and stairways and dark places should be controlled from two positions; electrical garden tools should be supplied from a l.v. transformer; and the entire installation should be carried out in accordance with the I.E.E. Regulations by a competent electrical contractor.



C.I.G.R.E.

Large Power Networks

The biennial meeting of the Conférence Internationale des Grands Réseaux Electriques (C.I.G.R.E.), the earlier proceedings of which were summarised in last week's issue, closed on Saturday. Below we give a résumé of the discussions at the remaining sessions

UNDER the general heading of High-Voltage Cables, a list of preferential subjects for discussion was submitted by L. G. Brazier (B.I.C.C.). A number of papers covered are summarised below.

Methods of accommodating thermal expansion and contraction uniformly along lead-sheathed cable lengths of 2,000ft laid in underground ducts were described by J. Banks (B.I.C.C.) and F. V. Wollaston (B.C. Engineering Co., Canada) with particular reference to the St. Lawrence Seaway (230 kV) and Kariba (330 kV). The authors stated that drawing in these large cables presented no difficulty in reasonably well aligned ducts and expansion needed to be allowed for only at joint manholes. Snaking resulting from restraint indicated that anchors might not be required except possibly on gradients. Fatigue behaviour of tape-reinforced lead sheaths suggested a higher allowable cyclic strain (0·15 per cent) than previously tolerated, with saving in manhole dimensions. With aluminium sheathing the figure could be 0·26 per cent. Extruded plastic finishes were excellent in installation and abrasive conditions.

Means of assessment of soil thermal resistivity and its influence on the current rating and installation cost of cables were subjected to analysis by R. S. Orchard (Merz & McLellan), C. C. Barnes (C.E.G.B.), P. M. Hollingsworth (B.I.C.C.) and K. Mochlinski (E.R.A.). Investigations in Great Britain, aided particularly by the transient probe method, had already shown that along many routes the maximum thermal resistivity was low enough at heavy load periods to justify uprating the cables. Ways of arriving at thermal resistivity values differed widely throughout the world and should be brought on to a common basis. Further investigations were required as follows:—Seasonal variations of moisture content for different types of soils; moisture migration and drying out; relationships between different kinds of back-fill and unexcavated earth; a simple method of soil classification.

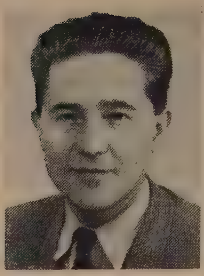
Possibilities of uprating 200 to 300 kV cables laid over distances of about 10 km (for which charging currents were relatively unimportant) were considered by C. T. W. Sutton and A. M. Morgan (Enfield Cables) and W. G. Hawley, N. Hewett and K. J. Hacke (Associated Electrical Industries). The most promising means was held to be increasing the current loading of conductors two to three times by using a cable cooled by forced circulation of water within a central pipe, which the authors regarded as superior to external self-contained cooling pipes. The need for cheap and compact heat exchangers provided the

Mr. L. G. Brazier

Mr. J. Banks

Mr. R. S. Orchard

Mr. P. M. Hollingsworth



Mr. K. Mochlinski

Mr. C. T. W. Sutton

principal technical problem. The original development of water-cooled cable arose from a modification of an existing electron synchrotron equipment at Glasgow University to increase its output from 300 to 450 MeV, space restrictions preventing any increase in the cross-section of the field-winding conductor. A similar type of cable was made for the modified Zeta equipment of the U.K. Atomic Energy Authority. For connecting a modern generator with its associated transformer, a large number of conventional cables or a busbar system was required, but there were technical disadvantages, besides high cost, which water-cooled cables would largely overcome. A design had been worked out for a 20 kV cable for this purpose.

Another way of cooling cables by water was discussed by P. Ralston and G. H. West (Canada), who suggested the possibility of increasing the load capability by as much as 50 per cent through the installation of closely-spaced multiple circuits adjacent to water pipes.

Comparing internal and external forced cooling, J. N. Oudin (France) submitted that although the former method was intrinsically more favourable for long lengths of 500 kV cable, the shorter critical length made its use difficult, since for a given external diameter the maximum power which could be transmitted was a function of the voltage gradient, but for less than 2 km of unburied cable 1,600 MVA could be transmitted at 600 kV. For greater distances 1,000 MVA could be transmitted at 500 kV through a buried oil-filled cable with forced external cooling.

Studies by J. A. Giaro (Belgium) indicated that the limit to the temperature rise gain in cables in a gallery with forced ventilation was about two.

It was reported by P. G. Priaroggia and N. Palmieri (Italy) that the introduction of epoxy resin mouldings had permitted stop joints of very much smaller dimensions to be made than for 230 kV oil-filled cables and had made feasible the development of 400 kV cables of that type.

A.C. Systems

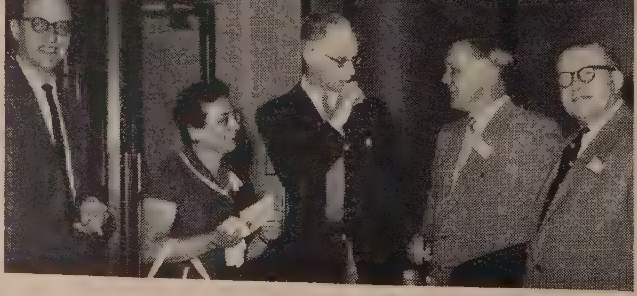
Views on the economic advantage of voltages equal to or above 380 kV under conditions prevalent in different countries were collated by P. Sporn (U.S.A.), F. Cahen and M. Magnien (France). In Germany, change from 380 kV to 500 or 600 kV was not thought to provide a worthwhile saving; moreover, it might hinder Western European interconnection at 380 kV which was nearing realisation. In Great Britain, since 380 kV allowed only 40 per cent increase over 275 kV in power transmitted, and wayleaves were difficult to obtain, transmission capability of 1,500 MVA per circuit at 500 kV was already under consideration. French opinion favoured three voltage grades, viz. 230, 400 and 690 kV. Swedish studies recently had shown that though a 40 per cent saving in investment was made by an increase from 225 kV to 380 kV, a further increase to 500 or 600 kV saved only a few per cent; as the need arose, a voltage as high as permitted by later techniques, e.g. 690 kV, was envisaged. In the U.S.A., where a rated voltage of 345 kV was in use, the next step might be 460 kV with 600 kV as a later possibility; P. A. Abetti (U.S.A.) forecast that 460 kV would be introduced there about 1962 and 650 to 690 in 1975.

Results obtained in operating the first 400 kV a.c. transmission system in the U.S.S.R., which delivered 7,610 million kWh from Kuibishev to Moscow in 1958, were given in detail by A. B. Krikuntchik and others, who also referred to the 486 MVA paper-oil series capacitors installed in units of 50 kVA at 600 V and 7·2 megohms reactance. The authors also presented some data on the 500 kV Kuibishev-Urals and the Stalingrad-Moscow projects.

Large Transformers

The chairman of the Study Committee on Transformers, E. T. Norris (Ferranti), reported that the development of the newer forms of synthetic insulation was not yet sufficiently advanced for practical engineering purposes, bearing in mind the range of transformers covered by C.I.G.R.E. discussions. The international interchange of views and experience by study groups, he believed, was encouraging a common trend of opinion that would simplify later standardisation by the International Electrotechnical Commission.

The need for more comprehensive measurements on electrical systems before establishing a standard test wave for switching-surge strength of transformers was empha-



M. H. Huizinga (K.E.M.A.), Mrs. ter Horst and Prof. ter Horst (Holland) and Messrs. F. G. Rowland and J. H. Epps (Switchgear & Cowans)

Mr. A. M. Morgan

Mr. W. G. Hawley

Mr. N. Hewett

Mr. K. J. Hacke

Mr. E. T. Norris

Mr. G. B. Harper

sised by J. R. Meador (U.S.A.). Three-phase transformers with reduced insulation, he said, should not have the phase-to-phase test requirement reduced by more than one insulation class. The growing need for corona measurement during low-frequency tests would preferably be met by the N.E.M.A. radio-influence-voltage method using the bushing capacitance tap instead of the N.E.M.A. capacitor. Sphere gap measurement of voltage during l.f. tests was cumbersome and inaccurate.

An international majority view of future dielectric test procedure was presented by G. B. Harper (C.E.G.B.) who submitted that no economy would result from reducing power frequency test values alone, since these were generally approximately equivalent to impulse values for the major insulation, whereas impulse tests dictated the inter-turn inter-coil insulation. The power frequency voltage test gave a good indication of ability to withstand switching surges and 1·3 times its peak value provided a reasonable correlation. Routine impulse voltage tests could permit some reduction of power frequency values. A separate switching-surge test was not justified by service experience. The N.E.M.A. test circuit, in the absence of more precise techniques, offered a practical comparative method, but further investigation into what constituted a dangerous level of discharge was essential.

Problems peculiar to large auto-transformers for interconnecting two h.v. systems (neither below 110 kV) were reviewed on behalf of an international committee by E. C. Rippon (Parsons) who first defined "direct regulation" as a method by which the voltage regulating winding was directly linked by the magnetic flux of the main auto-transformer; all other methods were covered by the term "indirect regulation," which entailed an extra magnetic circuit. No definite conclusions had yet been reached regarding the necessity for or the rating of delta-connected tertiary windings; these called for two definitions, one for stabilising windings and the other for load windings. It must not be assumed that the first was always less heavily loaded than the other. All 132/275 kV auto-transformers on the British grid had openable delta tertiaries. Their functions initially were to eliminate telephone and radio interference and to allow the application of satisfactory system protection to auto-transformers.

Modifications to the design of future 380/225 kV auto-transformers, which had now been in service on the Gennisiat (Alps)-Paris system for more than twelve months, were described by R. Langlois-Berthelot and J. Esparret (France). An important factor was the improvement in rail transport which permitted the conveyance of three-phase units instead of banks of 100 MVA single-phase units. No provision would be made for later addition of an on-load tap-changer and insulation of the earthed neutral would be required to withstand 17·5 kV instead of 52 kV as at present. All windings were required to withstand any type of short circuit; only the possibility of a phase-to-earth fault had been retained at the tertiary terminals, short circuits between phases being prevented by metal barriers between them. Reactance would be increased from the former 7 per cent to 9 per cent, resulting in a reduction of the weight and the iron losses but an increase of the stray losses.

The substantial reductions in weight and losses that characterised auto-transformers in comparison with conventional types were considered by J. B. Borodoulin and others (U.S.S.R.) to encourage their increasing use in 500 to 660 MVA banks for 400 to 500 kV. In the near future the authors anticipated the production of 1,000 MVA ratings which would simplify substation design.

Messrs. W. D. Horsley (C. A. Parsons) and L. W. James, F. H. Birch and A. Stalewski (C.E.G.B.)

In Canada, R. J. Kayser stated, nine million auto-transformers were now in service or ready to go into service, their voltages ranging from 69 kV to 345 kV with outputs up to 225 MVA for three-phase units and 450 MVA for banks of single-phase units. All were star-connected with solidly earthed neutrals. Over 90 per cent had delta tertiaries, often carrying loads, mostly capacitors or reactors. New high-voltage systems were being tied in with existing systems and 460/230 kV and 360/160 kV units were now under consideration.

Connection of surge divertors in parallel with the series windings of auto-transformers in addition to those connected to the earth terminals for protection were claimed by W. Rabus (Germany) to reduce overall cost of insulation, particularly with small transformation ratios.

Saving of core losses in transformers by uniform pressing of the whole core, reducing the maximum value of core pressure, eliminating bolt holes in the limbs and reducing their size at the yokes was referred to by H. Brechna (Switzerland). The procedure, he said, could lower these losses by from 18 to 22 per cent in three-phase distribution transformers up to 5,000 kVA. Annealing of the sheets and bonding without mechanical pressing, using only non-solvent adhesive materials, lessened manufacturing costs and noise level.

Ageing of transformers should be measured by polymerisation of the papers covering the conductors rather than by their mechanical strength, was a view expressed by J. Fabre and A. Pichon (France).

Towers

When the subject of transmission arose, H. B. Harvey (Tubewrights, Ltd.) and A. Erskine (South of Scotland Electricity Board) explained that in Great Britain during the last ten years, increasing opposition had been met, both from landowners and local planning authorities, to the erection of overhead transmission lines, chiefly on the grounds of amenity, resulting in protracted wayleave negotiations and a steady lengthening of the period from the inception of a project to the completion of construction. To solve the amenity problem, and at the same time to reduce the erection period, a prefabricated welded tubular type steel tower of unit construction had been introduced which was less conspicuous, less costly and much quicker to erect.

Mr. E. C. Rippon

Mr. H. B. Harvey

Mr. A. Erskine

Generators

Tests on a 30 MW steam turbine driven generator operating as a synchronous condenser were described by E. Powell, W. Mutch, A. Stalewski (C.E.G.B.) and J. E. Toms (C.E. Research Laboratories). It was shown that with full vacuum (28·5in Hg) the turbine could be motored with the stop valve shut without overheating and that the generator operating with zero excitation was stable under both steady state and transient conditions when equipped with a continuously-acting high-response-rate voltage regulator. Steam consumption was 17 per cent of that required for normal no-load running. Generator losses with a reactive power output equal to the MVA rating were normally 591 kW, but when motoring rose to 676 kW owing to turbine bearing friction and windage; the temperature rise as a generator was much higher than as a synchronous condenser. The overall cost of running a turbo-generator to provide reactive power was found to be less than that of a synchronous condenser provided that no additional expenditure was incurred on labour and boiler banking; otherwise the latter would be less costly.

For power factors lower than 0·85 it was calculated by M. Dureault and others (France) that the marginal cost of an alternator per kVAr was about 40 per cent of that per basic kW. Taking into account the low cost of the losses at the power station the authors concluded that reactive power should be produced by the generator provided it was consumed near the station, but for loads at more distant points of consumption, by capacitors which could be divided up in small units and had low losses compared with those incurred with small synchronous condensers, but the latter simplified regulation of reactive power and helped to suppress harmonics. Synchronous condensers of higher output were necessary only in special cases, such as the maintenance of stability on large transmission systems with few links or where loads fluctuated greatly. For dealing with such loads at places remote from generating stations rectifier excitation of the condensers with electronic regulators was stated by G. Hosemann (Germany) to have been proved successful.

Synchronous operation of alternators equipped with automatic regulation and forced excitation in emergencies was shown by experiments conducted by L. G. Mamikonjants and I. G. Syromjatnikov (U.S.S.R.) to cause, as a rule, no danger to generators or to the power system, the reliability of which could thereby be improved. To require retention of synchronism during all kinds of disturbance often entailed the provision of expensive and complicated apparatus, which would be unnecessary if quick resynchronisation followed the clearance of faults without serious disturbance to power consumers' operations.

Protection and Relaying

The report on the work of the study group on protection and relaying was presented by A. Huskin, chairman. The co-author, V. Sterner (Sweden), said it appeared to be generally known that the Buchholz relay, supplemented with certain protections against overloads and against tap-changer faults, was the most reliable form of protection against internal transformer faults, both incipient and severe. It was the only effective protection for overhead joints, open conductors, corona and core faults. A. R. Van C. Warrington (English Electric Co.) showed that the new American rate-of-rise-of-pressure relays were no faster than the original Buchholz relays, but they were applicable to transformers with or without conservator tanks. The use of the pressure diaphragm and micro-switch made them less susceptible to tilted mounting than Buchholz relays.

In a contribution on back-up protection Mr. Warrington said that the goal of protective relays was absolute assurance of tripping the breaker when required. Remote back-up was desirable because it could not fail for the same reason as the first line of defence, but where it was not possible to have such an arrangement, local relay and breaker back-up could ensure selective clearing of faults. The degree of duplication of components in local relay back-up depended on the importance of the protected circuit. The a.c. potential supply should have a delayed alarm and distance relays should have supervising relays working on overcurrent or rate-of-rise of current depending upon system conditions.

The principle of obtaining "unit" protection, i.e. a scheme responsive to power system faults within a restricted and clearly defined zone by comparing the currents flowing through the boundaries of the zone, was

Messrs. A. L. Ashton and R. H. Bunch (Pirelli-General) and D. H. Booth (Glover's)

first described by Merz and Price by whose names the basic systems are now generally known. The Merz-Price principle includes both the circulating current and opposed voltage methods of comparison. J. W. Hodgkiss (Associated Electrical Industries) pointed out that when the circulating current principle was applied to power systems, instability occurred despite the fact that the current transformers were similar and were operating well below saturation with the maximum through fault current. It was found empirically that the addition of resistance in the relay circuit greatly increased the stability and the use of a so-called stabilising resistance became general. Later, the cause of the transient unbalance or " spill " currents was investigated, and knowledge in this direction led to relays being designed for optimum performance. The author set out the principles of transient current transformer error, discussed the reactions of this theory on simple relays and extended it to cover biased relays.

Prof. V. I. Ivanov and others (U.S.S.R.) described relay protective systems using semiconductor devices which had been developed in the Soviet Union for distances, carrier current (including the receiver-transmitter) and differential protection. They showed that entire relay protective systems could be developed using semiconductors for the main elements as well as the logical part of the protection. The semiconductor devices were used in such a way that relay operation was practically independent of their characteristics. The use of semiconductors had enabled the relays to be reduced in size by a factor of 6 or 8 and they consumed three to five times less power. This enabled smaller current and potential transformers to be used.

Capacitive voltage transformers are used in high-voltage systems in continuously growing numbers. G. A. Gertsch (Switzerland) said that several supply authorities had experienced difficulties with poorly designed equipment due to sub-harmonic resonances and stable relaxation oscillations on system frequency which rendered the transformer useless. In addition, the protective relays fed by capacitive voltage transformers might not operate correctly if the secondary voltage variation differed appreciably from that of the primary voltage, especially during rapid changes in the latter during a short circuit. To overcome these difficulties, the characteristics of capacitive voltage transformers had been investigated and the author described tests, particularly two short-circuit and reclosure tests, which made it possible to judge the suitability of these transformers for use with different types of relays.

An automatic trip protection system for generating units in the power stations of the Consolidated Edison Co. was described by H. A. Bauman and others (U.S.A.). This system guarded the units from the fuel source to the high-voltage bus against major damage in most voltage troubles. It was first used in 1953 and was now in service on five conventional units varying in capacity from 180 to 335 MW and was being engineered for two conventional units of 340 MW each and one 275 MW nuclear unit.

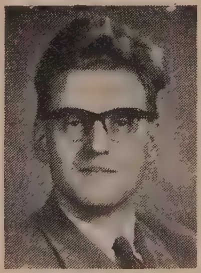
Circuit-Breakers

Field tests carried out on the Swedish 400 kV and 130 kV systems to investigate rapid transients caused by restrikes when interrupting line-charging currents were described by H. Witt and L. R. Bergstrom. These were found not to endanger apparatus or service reliability in most cases. In certain networks, however, voltage surges had reached values high enough to damage transformers and other equipment, the remedy being the exchange of a restriking breaker for another that gave no restrikes.

Salient factors in full-scale field tests were set out by E. C. Starr and E. J. Charrington (U.S.A.), who showed that control of fault current asymmetry and breaker contact parting was essential and that performance was materially influenced by voltage regulation (transient) at the supply busbars during interruption of capacitive currents. Particulars of a new synthetic method of proving air-blast breakers up to 300 kV and 20 kA were given by S. Yamazaki and colleagues. This was claimed to give a testing capacity ten times that of the normal laboratory.

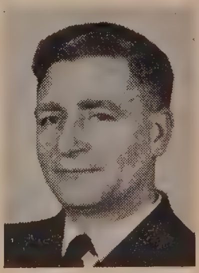
Studies of arc current and voltage round the zero passage of current at the K.E.M.A. laboratories on two models of air-blast breakers gave almost identical interrupting capacity in a 50 c/s circuit at 2,000 A (r.m.s.) and in a 500 c/s circuit at 200 A. The apparatus used was designed after discussions between the authors, D. ter Horst and colleagues (Netherlands) and the British Electrical Research Association and A. Reyrolle & Co.

Sulphur hexafluoride was stated by T. E. Browne and W. M. Leeds (U.S.A.) to have an outstanding dielectric recovery and a good a.c. arc-quenching performance under both plain-break and gas-blast conditions. It had been applied to designs of breakers up to 15,000 MVA at 230 kV. SF_6 had five times the density of air and could be employed at elevated pressures over a wide temperature range. It was suggested that negative ion formation might play an essential part in explaining the unusual electrical behaviour of arcs in this gas.



Mr. J. E. Toms

Mr. A. R. Van C. Warrington



Mr. A. Roxburgh

Tests carried out during the development of a six-break 350 kV circuit-breaker, evolved from two- and four-

1. Messrs. G. Froud (Electricity Council), C. S. F. Lane (British Insulated Callender's Cables) and J. S. Lombard (South Wales Electricity Board). 2. Messrs. R. F. A. Baldwin (Wakefield Dick) and T. M. H. Stubbs (B.E.A.M.A.). 3. Messrs. W. L. Wray (Wandleside Cables), A. G. Connell (East Midlands Electricity Board) and A. A. Barger (Wandleside Cables). 4. Messrs. A. G. Thomas and E. D. Iliff (Northern Aluminium Co.). 5. Messrs. A. Erskine (South of Scotland Electricity Board), W. Casson (C.E.G.B.) and H. B. Harvey (Tubewrights). 6. Messrs. R. H. Ryder, A. J. Chadwick and T. E. Calverley (English Electric Co.)

break designs incorporating resistors, formed the subject of a paper by A. Roxburgh (Associated Electrical Industries). The switchgear initially installed on the 275 kV British grid was 7,500 kVA, but 15,000 ratings were now on order and it seemed to him that a higher voltage would be inevitable later. Limitations of output of high-voltage plants throughout the world prevented the testing by normal methods of the very large triple-pole breakers that were being manufactured today. This necessitated unit testing and the adoption of any artifice that virtually increased the effective output of existing equipment. The over-voltages produced when disconnecting unloaded lines or when switching transformer magnetising current assumed a new importance at very high voltages when the insulation level might be determined by switching surges. The major economic saving due to the lower level recommended for effectively earthed systems could be achieved only by limiting switching over-voltages to values well below the basic impulse level. An advance to a higher voltage was feasible, however, by connecting more standard interruptors in series, as had been done with a successfully tested six-break 330 kV, 10,000 MVA, 40 kA design which was capable of extension to heavier duties in making and breaking faults, and capacitive and low inductive currents. The author illustrated a modified circuit for representing site fault conditions more accurately than was obtainable by means of lumped conductors at a testing station.

Interim results of an inquiry made by M. Perolini and colleagues (France) into the use of compressed air at pressures appreciably higher than those now generally adopted indicated the possibilities of improved performance or simplified construction of high-voltage air-blast circuit-breakers.

Social Events

The more strenuous side of the Conference was relieved by the excellence of the arrangements made by the French hosts for the entertainment of the delegates and their ladies. The high spot of these social events was the now traditional garden party and dance given by the French Committee at the Cercle Interallié. In addition, numerous railway and coach excursions were organised. Visits of technical interest during the Conference included those to the research and testing centre of Electricité de France at Fontenay, the Montereau thermal power station and 380 kV substation, and the Champagne-sur-Seine works of Le Matériel Electrique S.A. There were also visits after the Conference to the North of France, where delegates saw railway electrification works, the Ansereuilles thermal power station and the factory of Forges et Ateliers de Constructions Electriques de Jeumont. Another visit comprised a one-day tour in Chamonix at the foot of Mont Blanc, followed by a two-day technical visit, the first to see the Roselend dams and power plant (Haute-Savoie) and the second to Lyon to see the works of Câbles de Lyon, Ateliers de Constructions Electriques de Delle and the Delle-Alsthom testing and research station. After visiting the Chamonix-Mont Blanc region, some of the delegates went to the works of Savoisienne and Etablissements Merlin et Gérin as well as the Serre-Ponçon hydro-electric installation.

Electronic Terms Glossary

SOME 2,700 definitions are given in the new 350-page "Glossary of Terms used in Telecommunications (Including Radio) and Electronics" (B.S. 204 : 1960). The standard brings together all the terms previously dealt with in the 1943 edition and the various supplements published between 1948 and 1951. Many new terms and definitions are included and—where necessary to reflect technical developments and changes in usage—many of the definitions have been revised. Deprecated terms are indicated in a distinctive type face, as are obsolete terms. Noteworthy additions to the publication are a treatment of the terminology of semiconductor devices and data on information theory and inductive co-ordination. Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 35s.

United Kingdom Electrical Trade in May

ELECTRICAL exports from the United Kingdom in May were valued at £20·4 million, re-exports at £336,814, and imports at £4·5 million. Compared with the first five months of 1959, exports were 3·3 per cent higher, re-exports 10 per cent lower and imports 42 per cent more.

In the three months March-May, 1960, electrical exports were 4 per cent higher than in March-May last year; this compares with an increase in the previous three months, December-February, of 10 per cent over the corresponding period a year earlier. Total British exports were nearly 12 per cent higher during the first five months of this year than in January-May, 1959; and exports of "machinery other than electric" were, at £102·8 million, 20 per cent higher.

The largest individual market for British electrical

TABLE I.—ELECTRICAL EXPORTS

Class	Month of May 1960	Five months ended May 1959	Five months ended May 1960
	£	£	£
Generating sets:			
Diesel driven, not exceeding 10 kW ...	115,593	514,250	674,638
10 kW to 65 kW	114,369	702,143	757,926
65 kW to 200 kW	96,172	837,247	634,412
Over 200 kW	87,969	1,497,938	701,182
Driven by steam turbines	35,913	427,069	268,299
Driven by spark ignition engines, hydraulic turbines or other prime movers ...	71,937	199,708	147,662
Generators:			
Not exceeding 200 kW	83,032	491,432	508,867
Over 200 kW	70,645	474,323	643,978
Parts	1,480,024	3,211,484	4,895,928
Motors, complete, other than railway, tramway and trolley-bus:			
Not exceeding ⅓ h.p.	291,617	762,939	1,222,866
Over ⅓ h.p. but under 1 h.p.	102,421	239,599	347,087
1 to 250 h.p.	556,919	2,274,776	2,513,038
Exceeding 250 h.p.	120,825	832,709	1,023,106
Railway, tramway and trolley-bus motors, complete, and parts of all motors ...	221,935	1,156,583	993,248
Starting and controlling gear for electric motors	230,852	1,697,245	1,329,754
	3,680,223	15,319,445	16,661,991
Converting machinery	41,403	224,313	279,092
Mercury-arc rectifiers	39,603	257,232	217,242
Transformers for lighting, heating and power (including coils):			
Not exceeding 7,500 kVA	461,385	2,647,264	2,619,549
Over 7,500 kVA	186,856	2,156,449	1,396,436
Switchgear and switchboards (excl. telegraph and telephone):			
Switchgear up to 200 A, and not exceeding 660 V	333,718	1,864,084	1,900,037
Other	908,338	6,140,651	5,960,771
	1,971,303	13,289,993	12,373,127
Batteries and/or cells, primary:			
For lighting	113,286	516,449	534,113
For radio	387,939	1,788,499	1,950,453
Other	37,201	193,467	211,869
Parts (excluding carbons)	47,164	228,835	265,073
Lamps:			
Filament, exceeding 28 V	115,293	444,020	525,148
Not exceeding 28 V	25,808	155,711	153,990
Arc lamps, complete*	9,003	88,857	27,231
Discharge lamps, fluorescent tubes, etc.	104,076	487,236	444,250
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury-arc rectifiers), photo-electric cells (excl. photo-transistors), stabilising and cold cathode valves, magnetrons, klystrons ...	61,793	214,828	254,614
Cathode ray tubes	71,814	486,118	288,335
All other*	428,230	2,192,466	1,897,565
Parts (excl. glass bulbs)	53,032	142,664	210,756
Broadcasting and television transmitters	57,928	547,433	270,700
Communication and navigational and radar equipment	1,346,140	8,186,920	7,664,986
Domestic receiving sets, mains	61,980	525,403	375,551
Battery (incl. complete vibrator sets) ...	84,187	285,006	438,229
Other (incl. mains/battery and car) ...	38,161	153,577	157,516
Radiograms	42,004	131,326	165,336
Television receiving sets	57,860	342,391	315,283
Public address equipment	96,120	485,727	502,124
Other radio & television apparatus, n.e.s.	86,099	321,291	573,983
Components and parts, n.e.s.	1,166,368	3,950,284	5,542,613
	3,651,716	17,965,434	18,657,591
Telegraph and telephone installations ...	758,413	3,757,326	3,190,313
Telephone instruments	180,054	515,964	766,407
Parts	651,384	4,093,551	3,705,127
Line apparatus for long distance communication	287,735	1,052,229	1,227,061
	1,877,586	9,419,070	8,888,908

Class	Month of May 1960	Five months ended May 1959	Five months ended May 1960
	£	£	£
Cookers	48,795	185,984	219,142
Toasters	20,276	90,813	78,741
All other cooking appliances	44,464	169,038	216,270
Parts and accessories	87,845	419,127	460,316
Space heating appliances	20,922	114,457	124,975
Water heating appliances	31,333	145,718	153,142
Other heating appliances	30,060	127,227	124,698
Parts and accessories	93,145	379,880	456,055
Irons	71,067	335,974	359,145
Arc welding equipment, a.c.	40,786	215,965	231,001
D.c.	49,097	304,793	285,210
Resistance welding	25,139	182,399	177,298
Electric furnace plant	196,291	453,644	529,614
Magnetos, ignition	6,610	58,611	42,866
Sparking plugs	226,621	770,532	1,149,109
Electric appliances for aircraft	248,821	1,682,661	1,595,776
For motor vehicles	661,295	2,048,284	3,261,601
For cycles	65,096	199,221	259,405
Signalling apparatus (incl. traffic signals) ...	77,352	1,060,295	578,394
Instruments, commercial	217,454	904,515	979,881
House service meters (electrical) incl. parts	140,560	641,711	856,631
Electro-medical apparatus (excl. deaf-aids, and X-ray)	30,661	154,948	170,581
X-ray apparatus (excl. tubes and valves) ...	29,647	187,669	225,617
Ceiling fans	72,599	468,952	435,153
Desk fans and parts of desk and ceiling fans	31,612	76,270	119,603
Vacuum cleaners	179,343	706,661	769,888
Floor polishers	68,056	374,407	373,605
Food mixers	61,370	406,912	267,227
Hair clippers and dry shavers	150,989	177,256	406,562
Other portable appliances	39,675	110,910	142,833
Parts	225,649	560,951	866,571
Portable elec. tools, incl. parts* ...	246,846	1,014,876	1,243,127
Telegraph and telephone cables and wires:			
Submarine	13,276	3,082,645	1,267,930
Other	259,179	2,203,774	2,115,270
Other descriptions:			
Cotton, silk or man-made fibres insulated	28,605	96,820	113,636
Enamel, glass or asbestos insulated ...	97,847	462,199	542,099
Paper insulated	500,902	3,181,978	3,051,636
Rubber insulated	268,826	1,497,681	1,352,572
Thermoplastic insulated	424,453	1,174,887	1,676,446
Other	203,139	889,236	1,066,616
	1,796,227	12,589,220	11,186,205
Accumulators for motor vehicles ...	143,300	752,333	655,423
For traction purposes	13,399	97,612	90,669
For radio and other portable	50,339	136,826	160,408
All other accumulators	31,098	310,316	125,128
Parts and accessories	87,387	417,183	456,528
Electric wiring accessories	233,389	1,017,925	1,110,750
Electrical ceramic ware (incl. insulators) ...	140,413	552,014	646,994
Industrial electronic control equipment ...	147,474	569,539	753,643
Insulating cloth and tape	86,715	265,398	365,916
All other insulating materials	136,385	703,360	741,218
Permanent magnets	75,884	223,524	317,045
Radio, telegraph and telephone testing equipment, n.e.s.	118,672	660,493	771,828
Scientific electrical instruments (excl. telegraphic and telephonic; time recorders and time switches)	379,141	1,645,515	2,059,801
Electrical machinery, n.e.s.	38,279	173,828	159,538
Electrical apparatus and appliances, n.e.s.	1,319,444	4,649,490	5,273,423
TOTAL	20,357,620	99,392,253	102,782,298

* Figures for 1960 are not completely comparable with those for 1959.

exports in the first five months of this year was Australia, to which goods worth £9·2 million were sent compared with £7 million in the corresponding period of 1959. On the other hand, shipments to the next largest markets, India (£6·8 million), South Africa (£7 million) and the United States (£6·6 million) were still below the level achieved last year. These falls have been offset by an increase of nearly £2 million in exports to Canada, while Argentina, Venezuela and several of the smaller Commonwealth countries also have taken substantially more. In Europe exports to the two principal markets, Western Germany and the Netherlands, were down by £1·1 million.

For the second month running over £1 million worth of generating plant was shipped to Canada in May, bringing the total this year to £2·9 million. South Africa (£1·4 million), India (£1·3 million), Rhodesia (£985,855) and Australia (£850,002) have been the principal markets this year for converting machinery, rectifiers and transformers.

The United States (£1·4 million) remains the principal destination for exports of radio and electronic apparatus.

Exports of telegraph and telephone apparatus worth more than £1 million have been sent to South Africa and Australia this year, and two countries (India and the United States) have been sent more than £1 million worth of cables.

TABLE 2.—DISTRIBUTION OF EXPORTS (TABLE 1)

Country	Month of May 1960	Five months ended May 1959	Five months ended May 1960
	£	£	£
Gibraltar	19,185	49,708	94,456
Malta and Gozo	39,158	228,777	238,239
Cyprus	63,915	330,145	391,049
Sierra Leone	26,350	172,632	183,568
Ghana	237,306	1,004,798	1,383,050
Nigeria	466,396	2,427,851	2,637,759
Union of South Africa	1,349,001	8,295,063	7,104,406
Rhodesia and Nyasaland	647,818	3,069,426	3,453,921
Tanganyika	41,062	197,455	262,554
Kenya	190,218	819,671	854,362
Uganda	25,912	262,549	151,899
Mauritius	51,676	275,806	301,689
Aden	37,255	290,294	279,021
Bahrain, Qatar and Trucial States ...	130,773	500,031	567,991
Kuwait	249,807	977,658	1,137,913
India	910,542	8,326,773	6,810,275
Pakistan	268,033	1,366,306	1,635,293
Singapore	163,157	1,274,708	1,034,636
Federation of Malaya	154,827	1,335,502	1,003,816
Ceylon	224,877	969,884	921,741
British North Borneo	15,664	161,224	118,852
Sarawak	15,987	87,051	92,[illegible]8
Hong Kong	351,962	2,142,072	1,957,992
Australia	1,738,452	7,069,531	9,014,047
New Zealand	775,256	4,264,091	4,240,932
Fiji	43,953	165,839	120,619
Canada	2,015,159	4,893,508	6,657,086
Jamaica	195,019	701,472	871,107
Barbados	52,545	175,648	225,017
Trinidad	125,654	590,633	855,539
British Guiana	62,877	379,065	348,142
Other Commonwealth countries ...	209,079	1,101,539	992,837
Irish Republic	479,438	1,467,043	2,065,971
Soviet Union	44,233	513,111	668,930
Finland	241,398	499,543	937,806
Sweden	591,668	2,647,225	2,708,377
Norway	365,935	921,531	1,196,081
Denmark	225,545	1,102,443	1,475,662
Poland	41,591	208,477	363,510
Western Germany	489,003	2,831,268	2,348,621
Netherlands	588,398	3,423,250	2,812,974
Belgium	343,285	1,667,423	1,405,773
France	352,063	1,347,422	1,620,823
Switzerland	133,076	840,095	677,056
Portugal	208,995	1,178,405	1,056,966
Spain	328,461	927,547	1,080,058
Italy	485,237	1,587,922	1,965,388
Austria	77,412	224,325	331,855
Yugoslavia	129,993	403,237	562,083
Greece	62,952	602,719	502,638
Turkey	73,302	360,249	420,830
Belgian Congo	84,632	229,475	299,876
Portuguese East Africa	43,584	114,311	262,138
Egypt	75,458	927,653	571,444
Libya	45,490	390,058	315,649
Morocco (excluding Tangier)	17,408	186,945	108,063
Sudan	120,439	470,829	579,225
Syria	69,883	110,735	201,491
Lebanon	52,397	273,372	320,964
Israel	94,522	558,716	486,315
Jordan	58,928	481,060	418,279
Saudi Arabia	73,000	285,343	333,368
Iraq	226,506	1,746,141	1,193,777
Iran	173,018	1,694,394	1,090,167
Burma	57,998	468,735	248,797
Thailand	50,400	515,105	247,883
Indonesia	99,683	156,841	544,576
China	114,281	263,413	608,161
Japan	28,044	307,676	260,999
United States of America	1,257,025	7,296,847	6,647,606
Cuba	43,879	149,879	146,620
Mexico	93,777	179,380	538,694
Colombia	51,842	168,134	258,194
Venezuela	380,084	1,696,313	2,086,797
Peru	23,824	110,007	160,852
Chile	89,698	625,770	461,633
Brazil	61,368	447,920	252,184
Uruguay	27,707	50,080	111,946
Argentine Republic	272,042	818,900	2,003,622
Other foreign countries	409,843	2,008,276	1,878,840
TOTAL	20,357,620	99,392,253	102,782,298

TABLE 3.—SOURCES OF ELECTRICAL IMPORTS

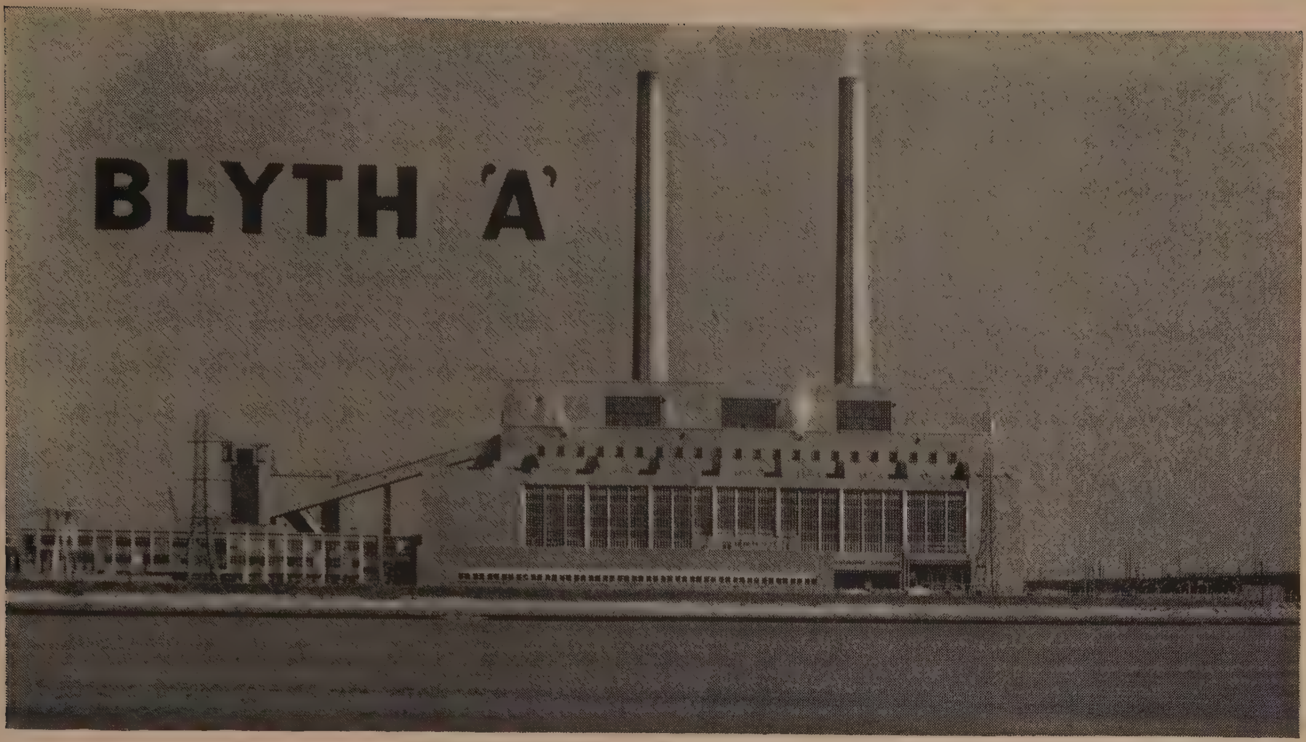
Country	Month of May 1960	Five months ended May 1959	Five months ended May 1960
	£	£	£
Australia	46,127	187,887	167,574
Canada	142,018	357,776	591,538
Other Commonwealth countries ...	230,018	537,101	918,595
Irish Republic	132,915	383,355	549,286
Sweden	81,400	557,935	485,987
Denmark	55,242	239,593	332,532
Western Germany	757,133	2,750,613	3,838,875
Netherlands	530,574	2,320,809	2,954,356
Belgium	41,068	223,061	217,503
France	224,483	646,183	794,254
Switzerland	130,906	620,948	709,998
Italy	127,540	419,749	644,575
United States of America	1,773,474	4,156,886	7,234,132
Other foreign countries	210,044	1,104,514	1,029,415
TOTAL	4,482,942	14,506,410	20,468,620

TABLE 4.—OTHER ELECTRICAL AND ALLIED EXPORTS

Class	Month of May 1960	Five months ended May 1959	Five months ended May 1960
	£	£	£
Domestic electric washing machines, incorporating centrifugal water extraction	399,054	1,718,750	1,379,482
Other, with or without wringers ...	269,608		1,238,030
Dryers (exported as separate units) ...	30,867		179,902
Parts	81,568	396,207	473,565
Electric locomotives (incl. battery types)	426,743	2,407,419	1,626,941
Diesel locomotives with electric transmission	291,978	1,125,555	1,111,707
Welding electrodes:			
Ferrous	117,922	409,340	641,689
Non-ferrous	26,577	104,994	127,377
Electric conduit tubes and cased tubes...	95,798	302,849	450,216
Electric carbons	107,260	498,788	526,586
Electric lighting fittings and lanterns (excl. arc lamps, searchlights and cycle lamps)	336,453	1,457,238	1,727,264
Electric fork-lift trucks	73,427	426,281	449,804
Water and gas turbine, etc.	597,141	1,546,207	2,489,560
Steam turbines	1,111,495	5,194,264	5,865,625

TABLE 5.—ELECTRICAL IMPORTS

Class	Month of May 1960	Five months ended May 1959	Five months ended May 1960
	£	£	£
Generators, incl. parts	99,052	319,499	326,198
Motors, incl. parts	203,686	590,454	879,028
Convertors; transformers; rectifiers ...	101,394	462,132	801,675
Switchgear and switchboards (not telegraph and telephone)	176,106	448,032	767,703
Cathode ray tubes, complete	33,132	423,337	207,208
Other valves, complete	336,775	1,149,241	1,667,451
Parts (excl. glass bulbs)	92,910	299,569	569,665
Radio receiving sets, domestic or portable	46,578	86,070	200,814
Radio communication and navigational aids, complete	447,227	1,670,854	2,138,512
All other radio and TV apparatus, parts and accessories	394,105	1,568,531	1,760,411
Telegraphy and telephony apparatus ...	69,639	479,144	288,108
Welding machinery	61,022	234,898	323,394
Electrical cooking and heating apparatus (other than for motor vehicles) ...	164,881	778,014	834,559
Magnetos, ignition, and electric appliances for aircraft, motor vehicles and cycles	255,233	795,997	1,426,553
Electro-medical apparatus (incl. X-ray apparatus)	93,697	408,997	538,902
Portable mechanical appliances, electrically operated, complete	134,922	525,003	578,184
Parts	70,378	287,190	319,302
Scientific electrical instruments (excl. telegraphic and telephonic)	188,714	656,744	865,257
Machinery, apparatus and appliances, n.e.s.	1,513,491	3,322,704	5,975,696
TOTAL	4,482,942	14,506,410	20,468,620



First Station with 120 MW Sets has Highest Operating Efficiency

THE official opening of the Blyth "A" power station of the Central Electricity Generating Board by Mr. J. C. Mitchell, former controller of the North Eastern Division, took place on Wednesday last. The station, the first equipped with 120 MW units to be completed, has an installed capacity of 480 MW and is the largest yet commissioned in the North-East. When we published a comprehensive description of this plant in our 27th February, 1959, issue only the first set was operating. Two further units were commissioned in June and November last year, while the fourth and final unit was put into service last month. The station has been operating with a unit availability of some 69 per cent and it achieved the highest average thermal efficiency of C.E.G.B. stations during 1959, with a figure of 33·88 per cent. The total works cost of electricity sent out is 0·36d/kWh.

The station is situated on the northern bank of the River Blyth some 15 miles north of Newcastle, on a site having a total area of 397 acres. Each of the four units consists essentially of a Babcock & Wilcox single-drum reheat boiler having a maximum continuous evaporative capacity of 860 klb/hr when supplied with feed water having a temperature of 435°F at the economiser inlet, and a 120 MW, 3,000 r.p.m. Metropolitan-Vickers turbo-generator with a three-cylinder impulse turbine and a hydrogen-cooled alternator. The steam conditions at the turbine stop valve are 1,500 p.s.i. and 1,000°F with single-stage reheating to 1,000°F. Each alternator generates at 13·8 kV, No. 4 machine being coupled through a generator/transformer to the 275 kV grid, while the first three machines can supply either this grid or the local 66 kV distribution system. The station supplies a winter peak local load of some 200 MW at this voltage.

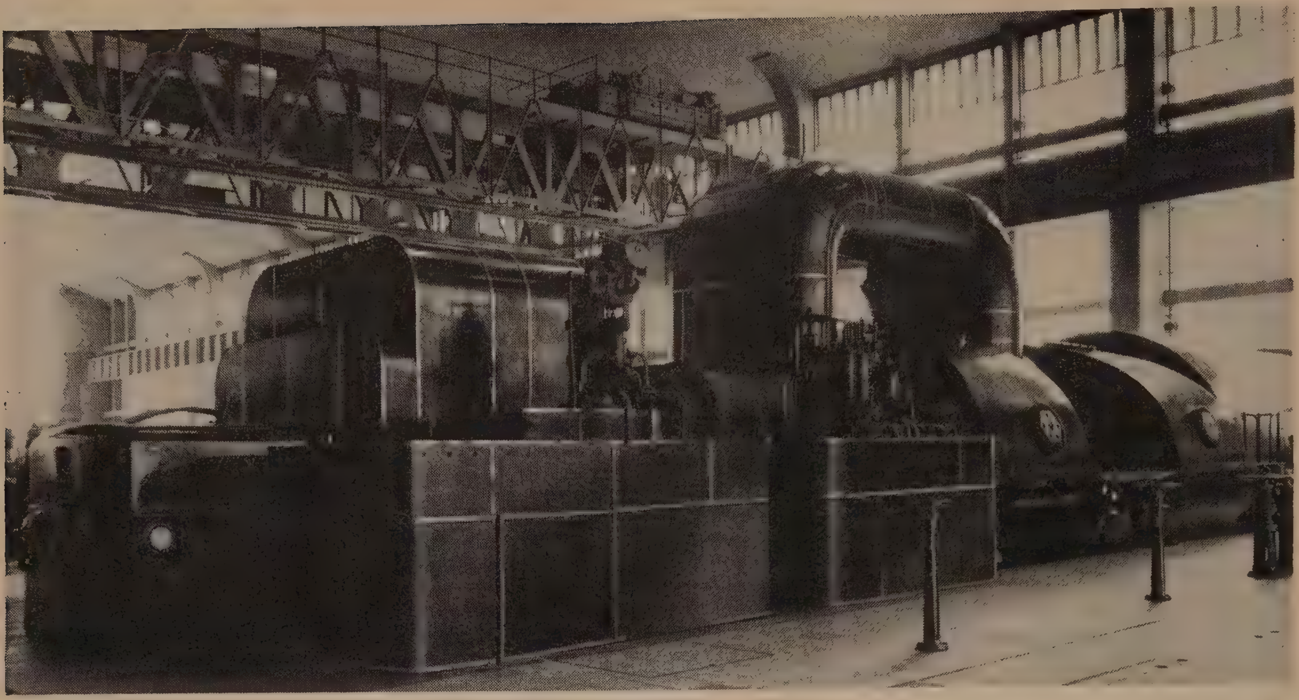
Coal consumption amounts to 36,000 tons per week of locally mined Northumberland untreated steam smalls of a calorific value between 9,800 and 10,750 B.Th.U/lb, which is delivered by rail to the 32 reception sidings and two loops at the coal handling plant. Since trains are received at all times, this area has been floodlit, two 150ft high and four 120ft high towers supporting a total of 211 1·5 kW tungsten lamps.

Among a number of interesting features at the station is the use of on-load shot cleaning for the 44,000 tubes in the two air heaters associated with each boiler. A considerable amount of work is being carried out to prevent marine growth in the circulating water system. In addition to intermittent chlorination by Wallace & Tiernan equipment of the water passing through the c.w. culverts, Crustex type VL oscillators producing sound waves at 28 kc/s in the water have been fitted. An

THIS STATION WAS ORIGINALLY DESCRIBED IN OUR ISSUE OF 27 FEBRUARY 1959

Other stations under construction which have been described in articles specially prepared by our technical staff since that date are as follows:

Kincardine	15/5/59	Drakelow "B"	18/12/59
Bold "B"	11/9/59	Ffestiniog	26/2/60
Little Barford "B"	13/11/59		



Steam end of one of the four 120 MW turbo-generators

experiment is also being carried out at this station by the Central Electricity Research Laboratories in connection with marine growth in which the effects of continuous and intermittent chlorination and ultrasonic vibration are being compared.

Construction has already begun on the " B " station scheduled for this site, the steelwork for the first boiler being in an advanced stage. When completed, this station will house two 275 MW and two 350 MW units, making a total site plant installation of 1,730 MW, one of the largest power concentrations under construction in Great Britain.

B.E.A.M.A. SURVEYS COMMON MARKET OPPORTUNITIES

ONE of the most powerful arguments for Britain joining the Common Market is that she would then be linked with six countries that show a remarkable capacity for sustained economic growth. The requirements of this community of 166 million people for electrical equipment and apparatus of all kinds is enormous. A survey published by the B.E.A.M.A. yesterday, estimates that in the five years 1959-1963 the Common Market countries will absorb electrical products amounting to some £14,000 million. This is equivalent to ten years' output of the British electrical industry.

The survey provides first an assessment of market size both generally and for individual product groups. It shows that the total annual installation or purchase rate of electrical products by the " Six," which in 1958 was some £2,300 million, will by 1963 have risen by about 44 per cent to £3,300 million.

There is a considerable variation in the rates of growth for different groups of apparatus. For major items of capital equipment for the supply industry (generators, wires and cables, and transformers) the rate is substantially below the average; the heavy electrical capital equipment of industry also shows a sub-average increase, and follows in broad measure the expansion of overall industrial output in the countries covered. The main capital items showing above-average increases are signalling equipment for the control of railway, road, sea and air traffic, and switch and protective gear. In contrast to the bulk of the capital items the major groups of " consumers' " equipment (radio and associated manufactures, batteries and accumulators, and domestic appliances) show estimated increases well above the average, " as they are not only meeting an expanding demand by new users and for new uses, but must furnish also supplies to meet steadily-rising replacement requirements."

The second half of the survey contains the background material on which the assessments of growth have been based. It discusses the social, geographical and economic factors that have had to be taken into account, and the general economic data and information on the organisation and operation of the electricity supply industry are given on a comparative basis for the individual countries.

The total value of electrical manufacture within the " Six " is some £2,400 million a year, and in the coming five years it is likely to rise by 50 per cent. As yet none of the national electrical manufacturing industries of the Common Market matches that of the United Kingdom. But, as the survey points out, those of Western Germany and France are advancing fast. They are likely to be stimulated by the freer trading conditions within the community and from this base to offer stronger competition in third markets.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Blanket Fires

I WELCOME Mr. Griffin's letter of 17th June calling attention to the serious dangers of electric blankets as at present used. In my opinion the danger lies mainly in the practice which is apparently common in this country of using the electric blanket *under* the sleeper and normal blankets above him.

In North America, where the use of electric blankets is common, they are invariably placed over the sleeper, a light electric blanket controlled by an energy regulator being the only cover needed in the coldest weather. It appears to me that a publicity campaign is needed to discourage the dangerous practice of using electric blankets under the bedclothes.

May I also reply briefly to Mr. Houldridge's letter on floor heating? I agree that what we want is reliable evidence. So far as I know not one of the advocates of electric floor heating has published a detailed study of the comparative cost of meeting the same heating requirements for a typical building by this and alternative means. Failing this information prospective users will be well advised to await the completion of the studies now being undertaken by the Heating and Ventilating Research Council.

London, S.W.1. C. L. CHAMPION, M.I.E.E.

REFERRING to the letter from Mr. D. Griffin in your issue of 17th June, it is, of course, agreed that B.S. 2612, and indeed all safety standards, both British and foreign, represents a minimum standard which can, and probably is, exceeded in many cases.

The question is, does B.S. 2612 represent a reasonable minimum standard for the type of blanket included within its scope? All knowledgeable people who have no axe to grind appear to agree that it *is* a reasonable minimum. At the same time, the fact that the standard is under review indicates that the B.S.I. committee responsible for its drafting is striving to keep abreast of improvements in design and materials.

The type of blanket dealt with by B.S. 2612 is admittedly the type which is essentially a bed warmer. Consideration is at present being given to the preparation of a standard for the type of blanket which is specifically designed to be left switched on all night.

London, W.1. C. DOUGLAS WOODWARD,
Press and Public Relations Officer,
British Standards Institution.

YOUR correspondent Mr. D. Griffin (*Electrical Review*, 17th June) makes the statement that "30 per cent of all fires in all buildings, that is industrial and commercial, in addition to domestic," were caused by electric blankets. The figures for 1956, published by the Joint Fire Research Organisation of the Home Office, show a total of 123,168 fires in the United Kingdom in that year. Of this total 51,464 occurred inside buildings and of these 8,632 were attributed to electrical causes. In the analysis of electrical fires no mention is made of electric blankets, these being included in the section headed "Other Causes" which totalled 1,792. Electric irons were the cause of 272 fires and it is reasonable to suppose that the number of fires caused by blankets must be less than this or a separate section would have been included in the analysis.

In fact your editorial of 20th May to which Mr. Griffin refers does not state that 2,622 fires due to blankets occurred in 1956, but that they were analysed in that year. A correct statement would be that ½ per cent of all fires inside buildings in 1956 could be traced to electric blankets. Having placed the statistics in order, the only reasonable conclusion to draw is that the B.S. is quite adequate and a major reduction in the number of fires due to electrical causes can be brought about only by the further education of the public in electrical safety and the dangers involved in the misuse of any electrical appliance or apparatus.

Leeds. B. V. DIGHTAM, A.M.I.E.E.

Floor Heating and Radiator Systems

IN domestic and many commercial installations, the initial cost of the installation is of secondary consideration. An example of this is that by dispensing, in a new house, with fireplaces, chimney breasts, fuel store, etc., the saving will more than offset the cost of the form of central heating chosen.

We must therefore consider the running and maintenance costs only. In this respect I think that all the correspondents have missed the cheapest and certainly the most economical form of heating. By using a heat pump on low-temperature heat in the ground, or other suitable place, free heat can be pumped into a house for the price of the electricity consumed by the compressor motor. It is much more flexible than any form of storage heating and will meet all four points made by Mr. Hazel in his letter published in the 17th June issue.

With this system it is possible to provide air conditioning or cooling when necessary (even in England it is

DOMESTIC APPLIANCE SURVEYS

For six years we have been publishing at regular intervals illustrated surveys of the domestic electrical appliances currently on the market. They have proved popular and useful and many readers have asked us to produce them as self-contained detachable supplements. We have decided to do this and the first, dealing with electric fires, will be included in next week's issue sometimes necessary) thereby using the plant all the year round and being more economical.

I must disappoint Mr. Houldridge by confessing that I cannot back up my remarks with facts and figures but would agree with him that the many alternatives should be investigated and compared fully.

Can we have, therefore, some fresh ideas from heat pump specialists to show the advantages over the only other forms of heating considered ?

Stockton-on-Tees. JOHN A. SMITH.

E.H.V. Power Cables

IN my article in your issue of 17th June reference is made on page 1156 to high-voltage d.c. transmission and the following comment is made:—" The use of d.c. will permit savings in cable costs but at the present time these savings do not compensate for the high price of conversion equipment until distances of at least 30 miles are considered."

It is, I hope, clear from the context that my observations refer to d.c. submarine cables. More detailed information on this issue will be found in the recently published article " D.c. Power Transmission, Part VI, Planning and Economics," by J. L. Egginton, in the *Electrical Journal* dated 6th May.

Sutton, Surrey. C. C. BARNES.

Technological Awards Report

THE recently published annual report of the National Council for Technological Awards shows that there are now 95 recognised courses at 23 colleges leading to the Diploma in Technology. Nearly 4,000 students—including 84 women—have been enrolled. A total of 163 students, including one woman, have now been awarded the Diploma, equal in standing to an honours degree at a university. Out of the total number of students registered, 3,442 are studying for the award by the " sandwich " course method entailing alternate periods in industry and at college. The comparative figure last year was 2,323. The report mentions the requirement that students following courses leading to the Diploma should be able to participate in a " substantial " research project, and gives instances of the advanced work involved. In some cases, the projects are selected by the students themselves; in others, they are devised with regard to the particular interest of the student and any specialised equipment which may be available in the technical college concerned.

In May, 1959, the Council established the College of Technologists, membership of which constitutes an award higher than the Diploma in Technology, broadly equivalent in standard to the Ph.D. degree of a university. By the end of March this year, nine applications to register as candidates had been received. A memorandum is published with the report setting out the requirements regarding the industrial training of students for the Diploma. The responsibilities of firms providing industrial training and of colleges which the students attend are defined and particular information is outlined about industrial training which will in future be required by the Council before they recognise a course.

I.E.E. PREMIUMS

THE I.E.E. Council has awarded the following premiums for papers read or accepted for publication during 1959:—

GROUP A

Kelvin Premium (value £25): E. P. Butt, B.Sc. (Abingdon), R. Carruthers, B.Sc.(Eng.) (Abingdon), J. T. D. Mitchell, B.Sc.(Eng.) (Abingdon), R. S. Pease (Harwell), P. C. Thonemann (Harwell), M. A. Bird, B.Sc. (Sale), J. Blears, B.Sc.(Eng.) (Manchester), and E. R. Hartill, B.Sc.(Eng.) (Sale).

John Hopkinson Premium (value £25): D. A. Barron, M.Sc. (London).

GROUP B

ELECTRONICS AND COMMUNICATIONS SECTION PREMIUMS

Duddell Premium (value £20): G. B. B. Chaplin, M.Sc., Ph.D. (Romsey), A. R. Owens, M.Sc. (Bangor), and A. J. Cole, B.Sc. (Romsey).

Ambrose Fleming Premium (value £15): A. E. Karbowiak, Ph.D. (Harlow), and V. H. Knight (Enfield).

Premiums (value £10 each): A. H. W. Beck, M.A., B.Sc.(Eng.) (Cambridge); Prof. A. L. Cullen, Ph.D., B.Sc.(Eng.) (Sheffield); L. Lewin (Enfield); G. Craven (Enfield) and V. H. Knight (Enfield); R. Beaufoy (Maidenhead); and H. A. C. Hogg, B.Sc. (Wembley).

MEASUREMENT AND CONTROL SECTION PREMIUMS

Silvanus Thompson Premium (value £20): L. Essen, O.B.E., D.Sc., Ph.D., F.R.S. (Teddington), E. G. Hope, B.Sc. (Teddington), J. V. L. Parry, M.Sc. (Teddington), and J. McA. Steele, B.Sc.(Eng.) (Teddington).

Mather Premium (value £15): W. K. Taylor, B.Sc., M.Sc., Ph.D. (London).

Premiums (value £10 each): A. M. Thompson, B.Sc. (Chippendale, N.S.W.); and O. P. D. Cutteridge, M.Sc.(Eng.), Ph.D. (Manchester).

SUPPLY SECTION PREMIUMS

Sebastian de Ferranti Premium (value £20): T. H. Mason (London), P. D. Aylett, Ph.D., M.Sc.(Eng.) (London), and F. H. Birch, B.Sc.(Eng.) (Newcastle).

John Snell Premium (value £15): J. S. Forrest, M.A., D.Sc. (Leatherhead), P. J. Lambeth, B.Sc.(Eng.) (Leatherhead), and D. F. Oakeshott, B.Sc. (Kingston-upon-Thames).

Premiums (value £10 each): F. S. Fay, M.A. (Newcastle-on-Tyne), J. A. Thomas, B.Sc. (Jarrow), D. Legg, B.Sc. (Loughborough), and J. S. Morton, B.Sc. (Cullercoats); and T. R. Manley, B.Sc. (Hebburn), K. Rothwell (Whickham) and W. Gray (Sunderland).

UTILISATION SECTION PREMIUMS

Crompton Premium (value £20): M. C. Crowley-Milling, M.A. (Manchester).

Swan Premium (value £15): D. B. Corbyn, B.Sc.(Eng.) (Stafford), and N. L. Potter, B.Sc.(Eng.) (Stafford).

Premium (value £10): E. Jacks (Aughton).

NON-SECTION PREMIUMS

Llewellyn B. Atkinson Premium (value £15): C. J. Carpenter, M.Sc.(Eng.) (London).

GROUP C

Heaviside Premium (value £15): P. R. Bryant, M.A., M.Sc. (Wembley).

Oversea Premium for Senior Members (value £15): S. Y. King, B.Sc.(Eng.), Ph.D. (Hong Kong).

GRADUATE AND STUDENT PREMIUMS

Premiums (value £10 each): R. Hawley, B.Sc. (Newcastle-on-Tyne); and P. Powers, B.Sc. (Newcastle-on-Tyne).

Premiums (value £5 each): B. G. Cryer (Sheffield); K. Gunary (Sutton Coldfield); G. L. Horrobin (Longton) and A. D. Hawkins (Alsager); J. M. Walker (Cheltenham); and M. H. Walshaw, B.Sc.(Eng.) (Farnborough).

INDUSTRIAL NEWS

Atomic Consortia Join Forces

As a result of further discussions between Atomic Power Constructions, Ltd., and the G.E.C./Simon-Carves Atomic Energy Group, these companies have now agreed to join forces to design and build nuclear power stations in this country.

It is understood that a new management company will be set up. The chairman will be Mr. Arnold Lindley, vice-chairman and managing director of the G.E.C., and the managing director will be Col. G. W. Raby, managing director of Atomic Power Constructions. Last September it was announced that the two groups had reached agreement to collaborate on the present lines and that they had agreed to submit joint tenders for Dungeness and further British stations. It was also stated that negotiations with a view to long-term collaboration on future reactor systems were continuing. In the event it did not prove possible to agree on the scope and functions of a new organisation and in March this year the negotiations were terminated.

How far the new agreement goes has not been made clear. It does not affect existing contracts and commitments in this country or overseas, and for the present, at least, the two groups will continue to operate independently abroad.

The Atomic Power Constructions Group consists of Crompton Parkinson, Fairey Aviation, International Combustion and Richardsons Westgarth. It is also associated with Trollope and Colls and Holland & Hannen and Cubitts. The G.E.C./Simon-Carves Group is associated with the Motherwell Bridge & Engineering Co. and John Mowlem.

Welding Industry Delegation to Russia

A delegation from the British welding industry left London last week for a visit to the Soviet Union at the invitation of the State Scientific and Technical Committee of the Council of Ministers. The eight members of the delegation, led by Mr. D. J. W. Boag, managing director, Rockweld, Ltd., will tour the all-Union Welding Exhibition in Moscow, as well as visiting factories and possibly research establishments, before returning on Friday, 8th July. It has been agreed that this technical mission will be followed by a reciprocal visit to this country by Russian technical experts. The exchange of visits has been arranged by the British Electrical and Allied Manufacturers' Association.

Other members of the delegation are: Messrs. R. L. Swan (Lincoln Electric Co., Ltd.), G. M. Harvey (British Oxygen Gases, Ltd.), G. H. Moule (A.E.I. (Manchester), Ltd.), W. S. Simmie (Pressed Steel Co., Ltd.), D. Wyllie (Babcock & Wilcox, Ltd.), R. H. Boughton (English Electric Co., Ltd.) and T. F. Tribe (British Federal Welder & Machine Co., Ltd.).

C.E.G.B. University Scholarships

Twenty-one boys and three girls have been awarded university scholarships by the Central Electricity Generating Board. The value of each award is £400 per annum (Cambridge and Oxford £450). The awards are made under the electricity supply industry's scholarship scheme for school leavers, the object of which is to enable suitable recruits to the industry to attend university to study engineering or a science subject. During certain of the university vacations practical training is given in the industry and upon completion of the course the graduates will join the Generating Board's staff, mainly for research work. The 24 awards were made after interviews with some 300 applicants at nine centres throughout the country.

Hawker Siddeley Research Centre

A new research centre for Hawker Siddeley Industries, Ltd., is to be established at Stockport. The centre will provide basic research and development facilities for Mirrlees, Bickerton & Day, Ltd., and the National Gas & Oil Engine Co., Ltd. Costing more than £200,000, it will be equipped with modern laboratory and testing equipment and will cover an area of 25,000 sq ft. It is expected to be completed early next year. The centre will be directed by Dr. J. A. Pope.

Indian Railway Contract for B.I.C.C.

Mr. H. F. Akehurst, director (overseas operations), British Insulated Callender's Cables,Ltd., explains to H.R.H. the Duke of Edinburgh some features of the 138 kV submarine power cable joint on the B.I.C.C. Group stand at the New York Exhibition

A further contract for the supply and installation of overhead equipment for 25 kV 50 c/s a.c. railway electrification has been awarded to the British Insulated Callender's Cables Group by the Indian Railway Board. This job is valued at £1,200,000 and covers some 300 track miles of the Eastern Railways system. The route to be equipped is on the main line from Delhi to Calcutta and lies between Gaya and Moghalsarai. It forms part of the second phase of the Indian Railway Board's electrification programme and is to be ready for use by July, 1961.

The equipment will be similar to that at present being installed by the group for the South Eastern Railway, the order for which was announced in December, 1958. Such rapid progress was made on that scheme that it was possible for a section of the line to be energised only 12 months later so that an electric locomotive could make a demonstration run for delegates attending a meeting of the International Railway Congress Association. Both contracts were secured in the face of keen international competition.

Technical Staff College

Sir David Eccles, the Minister of Education, announced last week that he was giving immediate authority for the establishment of a national technical staff college. This is the outcome of a successful appeal for funds made to industrial concerns; a hundred of those had subscribed £105,000. The recommendation that a staff college should be instituted originally came from the Willis Jackson Committee on the supply and training of teachers for technical colleges in 1957, the idea being, as we reported at the time (*Electrical Review*, 15th November, 1957), to provide means by which "senior staff members of colleges and representatives of industry, commerce, Government Departments and the universities and schools could discuss the aims, needs and methods of technical education in the light of experience and development in these related fields."

Aluminium Mill Electrical Equipment

A £500,000 contract has been awarded by James Booth Aluminium, Ltd., Birmingham, to the English Electric Co., Ltd., for the electrical equipment for a new 148in four-high hot aluminium rolling mill, the largest of its kind in Western Europe, and a new 72in four-high cold strip mill. The new mills, designed and supplied by the Loewy Engineering Co., Ltd., are part of James Booth's £5 million expansion scheme and are to be installed in the company's Kitts Green Works, Birmingham, during 1961.

The electrical contract includes main motors for the four-high mills and edging mill, as well as a large number of ancillary motors, converting equipment, control gear and switchgear, and such auxiliaries as lubricating and ventilating equipment.

Radiation Monitors

Ekco Electronics, Ltd., has received an order from the Central Electricity Generating Board for 86 radiation monitors. They will be used at the Board's nuclear power stations at Berkeley, Bradwell and Hinkley Point and are all portable, battery-operated instruments.

Belling Factory Extension

The accompanying photograph shows the north end of an extension to the Enfield factory of Belling & Co., Ltd. It will eventually have a total area of 63,000 sq ft. The top floor will be used mainly for a new canteen; the first floor will accommodate a range of stocks of finished electric fires and cookers as well as spare parts; and the ground floor will be allocated to the fabrication of cooker components and the storage of sheet steel.

Extension to the Belling factory at Enfield

Design Centre at Liverpool

An average of 2,150 people a day (only 50 fewer than the number attending the Design Centre in London) visited the recent Design Centre Exhibition at Liverpool. The exhibition, which was open for 16 days, occupied about 3,000 sq ft, and domestic electrical appliances and lighting fittings were included among the 400 "well-designed British products" shown. Supporting displays were arranged in some thirty stores and shops and in the showrooms of the Merseyside and North Wales Electricity Board.

An E.A.W. for New Zealand

After a recent address by Viscountess Kilmuir, president of the Electrical Association for Women, at a meeting sponsored by the Electrical Supply Authorities Association of New Zealand, it was decided to form an E.A.W. for New Zealand. Lady Kilmuir spoke of the increasing interest of women in electricity in the home and gave details of the organisation of the United Kingdom E.A.W.

Power Transistor Production

Semiconductors, Ltd., state that they have acquired from Sylvania-Thorn Colour Television Laboratories, Ltd., the production equipment for the manufacture of n-p-n germanium power transistors. They will shortly be manufacturing and marketing types developed by that company, specifically for use in industrial applications.

South African Commercial Computer Service

The first commercial computer service in Africa is to be set up in Johannesburg by a new company, LEO Computer Services (Proprietary), Ltd., established by LEO Computers, Ltd., of London, and Rand Mines, Ltd., and will be operating by April, 1962. The installation, costing over £250,000, will consist of the advanced all-transistor model computer, the LEO III, and will be equipped with a very large magnetic core storage system to facilitate the automatic handling of complex commercial problems. Input to the system will be by photoelectrically read paper tape and punched cards, and output by paper tape, punched cards and a high-speed printer operating at 50,000 lines an hour.

In addition to operating the Johannesburg service bureau, the new company will market LEO computers in South and Central Africa, including the Rhodesias and the Portuguese territories adjoining. It will also provide a maintenance service.

Plessey Overseas Agents

Fifty delegates from overseas agencies of Plessey International, Ltd., the export marketing organisation of the Plessey Co., Ltd., arrived in England on 20th June for an agents' convention lasting a fortnight. During the first week the delegates were shown over the main Plessey development laboratories and factories and a convention dinner was held at Grosvenor House, London. The second week has been mainly occupied with study and discussion groups.

Equipment for Main-line Diesel Locomotives

The British Transport Commission has placed orders, valued at about £11 million, for another 170 sets of diesel engines and transmissions for main-line diesel locomotives which are being erected in British Railways' workshops.

Of the 170 sets, 79 are for diesel engines with hydraulic transmission and 91 for diesel-electric equipment. The Brush Electrical Engineering Co., Ltd., is supplying 66 power equipments incorporating Sulzer 12LDA28 2,500 h.p. diesel engines and electric transmissions, while the A.E.I. Traction Division is to supply 25 equipments with Sulzer 6LDA 1,250 h.p. diesel engines and electric transmissions.

Edmundsons Group Reorganisation

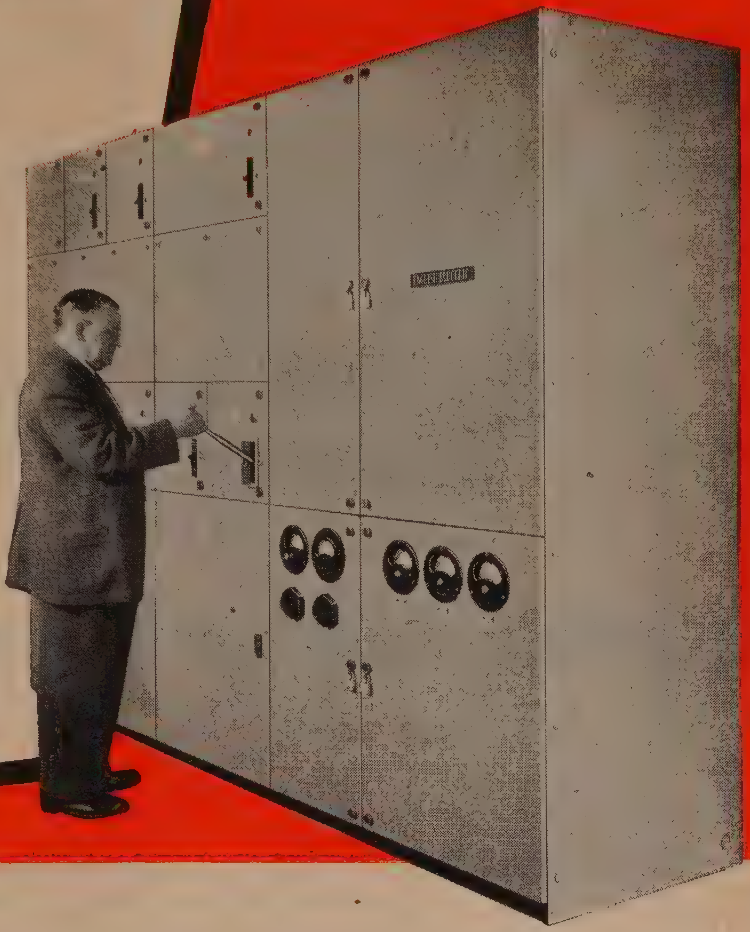
The Edmundsons Electric Co., Ltd., announces that it is amalgamating its interests in the Midlands under the title Edmundsons (Midlands), Ltd. From 1st July the following companies and/or branches will trade under the new title:—F. Westerman (Wholesale), Ltd., Birmingham; Electro-Mechanical Supplies, Ltd., Coventry and Leicester; and Edmundsons Electrical Wholesalers, Ltd., Manchester. These companies have been members of the Edmundsons Group for some time and the amalgamation of their interests will enable them, collectively, to provide a better service throughout the Midlands

[*Continued on page* 29

JOINT SWITCHBOARD INSTALLATIONS

REDUCE COSTS IN INDUSTRIAL SUBSTATIONS

The illustration shows a composite 'Superform' switchboard installed in the substation of a large warehouse in the Midlands. The switchboard accommodates both the Supply Authority's open type substation equipment and the outgoing circuits to the warehouse within the one unit. The busbars of the substation board and outgoing 'Superform' section are coupled together, both electrically and mechanically, making the composite Switchboard a complete entity.



THE BASIC ADVANTAGES OF THIS NEW DESIGN ARE—

- ★ Compact arrangement with economy of space
- ★ Saving in building costs
- ★ Saving in installation costs
- ★ Attractive appearance of the installation

Plus

The latest exclusive technical features of 'ENGLISH ELECTRIC' 'Superform' Switchboards and Open Type Substation Distribution Equipment.

For further details write to:
The ENGLISH ELECTRIC Company Limited, Fusegear Division, East Lancashire Road, Liverpool, 10

'ENGLISH ELECTRIC'

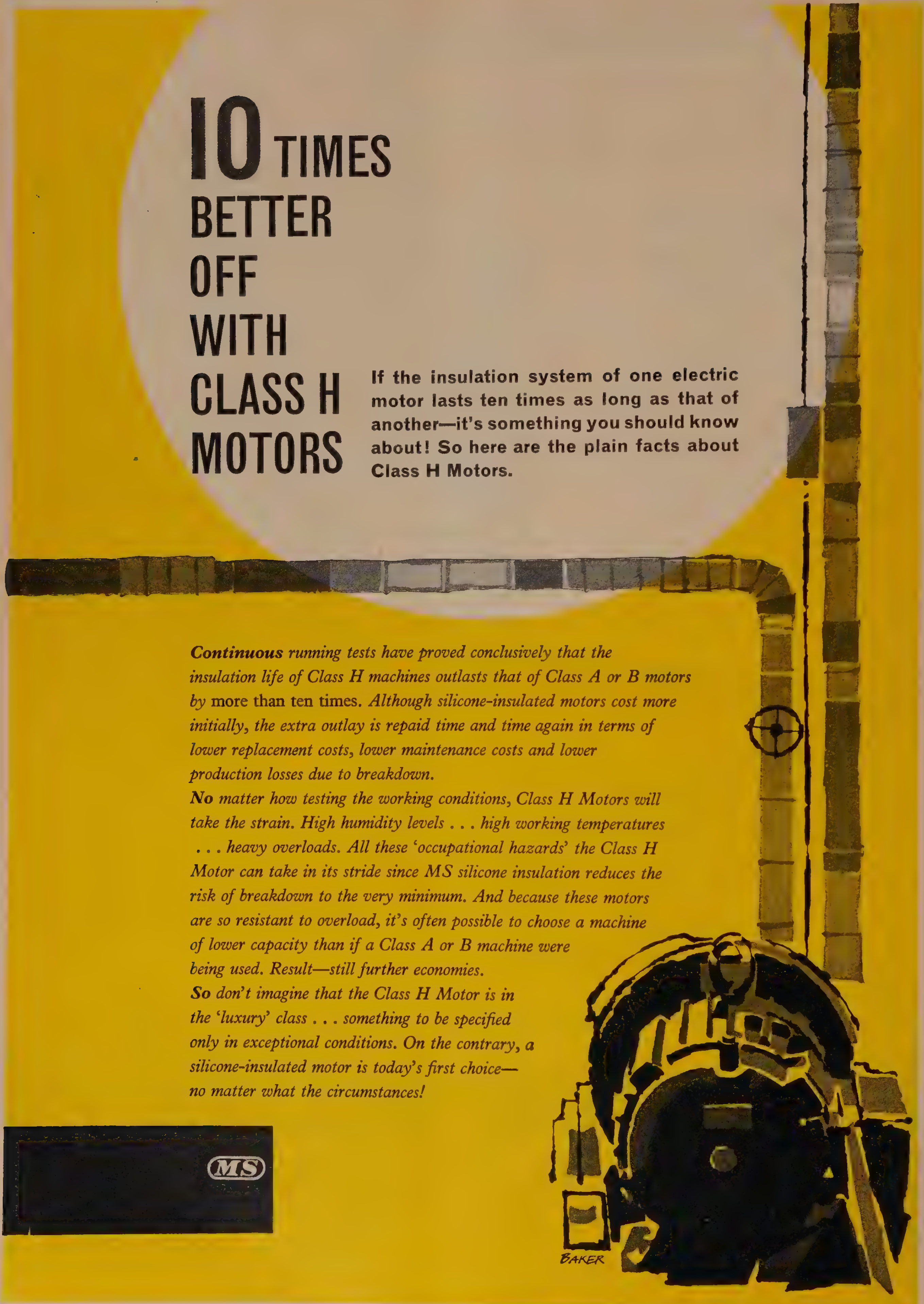
'Superform' Switchboards

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2.
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

FG.46

10 TIMES BETTER OFF WITH CLASS H MOTORS

If the insulation system of one electric motor lasts ten times as long as that of another—it's something you should know about! So here are the plain facts about Class H Motors.



Continuous *running tests have proved conclusively that the insulation life of Class H machines outlasts that of Class A or B motors by* more than ten times. *Although silicone-insulated motors cost more initially, the extra outlay is repaid time and time again in terms of lower replacement costs, lower maintenance costs and lower production losses due to breakdown.*

No *matter how testing the working conditions, Class H Motors will take the strain. High humidity levels . . . high working temperatures . . . heavy overloads. All these 'occupational hazards' the Class H Motor can take in its stride since MS silicone insulation reduces the risk of breakdown to the very minimum. And because these motors are so resistant to overload, it's often possible to choose a machine of lower capacity than if a Class A or B machine were being used. Result—still further economies.*

So *don't imagine that the Class H Motor is in the 'luxury' class . . . something to be specified only in exceptional conditions. On the contrary, a silicone-insulated motor is today's first choice—no matter what the circumstances!*

MS

REMEMBER SILICONES FOR REWINDS TOO

The value of silicone insulation is by no means restricted to new machines. Many a troublesome Class A or B motor—given to repeated breakdowns—has been totally transformed by a timely silicone rewind.

At the Latchford Locks Works of the British Aluminium Co. Ltd. a centrifuge, used for cleaning aluminium swarf, is powered by a 15 HP motor which is mounted beneath the centrifuge. To help in the cleaning, live steam at about 10 psi is admitted to the centrifuge while it is in motion. The motor, when new in 1954, was wound with Class A insulation, but failed after eight months due to condensation on the windings. Rewound with Class A it failed again—this time after only two weeks' service. To prevent repetition of these failures the motor was then rewound using silicone insulation, and in fact ever since it was recommissioned in May 1955, British Aluminium report, 'the centrifuge has been used almost constantly without further trouble with the motor windings'. They go on to say, 'There is no doubt that the employment of silicone insulation has greatly lengthened the trouble-free working of the winding of this motor.'

***Amongst** the leading manufacturers of Class H motors are: Associated Electrical Industries (Rugby) Ltd · The English Electric Co Ltd · The General Electric Co Ltd · Bruce Peebles & Co Ltd · Woods of Colchester Ltd · Brook Motors Ltd · Lancashire Dynamo & Crypto Co Ltd · Brush Electrical Engineering Co Ltd · Howells Electric Motors Ltd · Laurence, Scott and Electromotors Ltd.*

For a list of names of the many rewinders experienced in the use of silicone insulation, contact your nearest Midland Silicones branch office.

All over Britain, MS silicones are strengthening the weak link in electrical equipment—its insulation. Midland Silicones Ltd manufacture a full range of silicone products for use in the electrical industry. And Midland Silicones Ltd consistently set the pace for progress in this fast-developing field.

MS

MIDLAND SILICONES LTD ***first*** *in British Silicones*

(Associated with Albright & Wilson Ltd. and Dow Corning Corporation)

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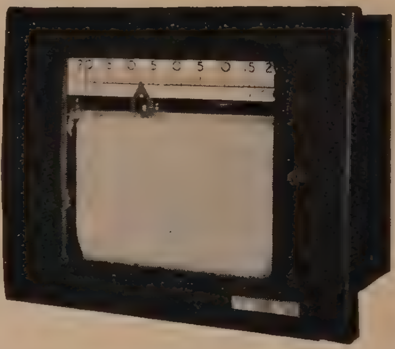
Area Sales Offices: Birmingham · Glasgow · Leeds · London · Manchester · Agents in many countries

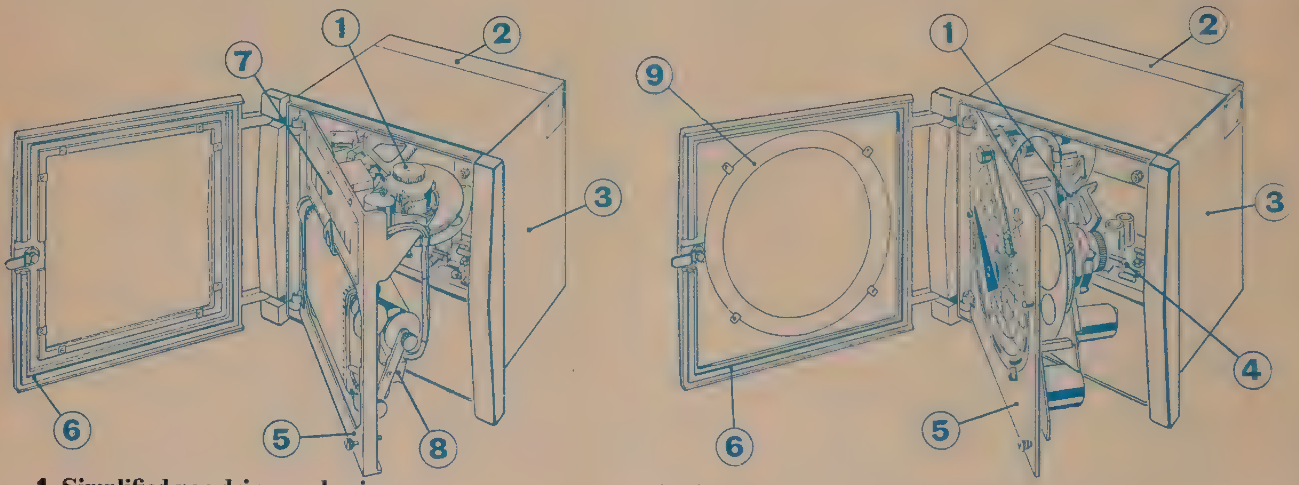
MSE 4

New servo rebalance indicator/recorders offer high performance at low cost

Available in 10″ circular chart and 10″ wide strip chart versions with 1 second full scale traverse and common mechanisms of simple rugged design providing a performance comparable with many more expensive instruments.

Both circular and strip chart versions are available with a wide range of measuring elements of all types–for temperature, pressure, flow, mechanical force, linear displacement. A special feature is the wide range of electrical measurements for which the instruments cater. A three-term control unit and associated electro-pneumatic valve positioner together with a comprehensive range of pneumatically operated valves are also offered in the form of completely integrated schemes.





- **1** Simplified pen drive mechanism
- **2** Ease of access for connections
- **3** Rugged steel case
- **4** Replaceable control units for required characteristics
- **5** Hinge-out construction for ease of access
- **6** Dust-sealed cover
- **7** Clear easy-to-read scale
- **8** Hinge forward paper feed mechanism
- **9** Large diameter indicator scale

LANCASHIRE DYNAMO ELECTRONIC PRODUCTS LIMITED

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RUGELEY · STAFFORDSHIRE · ENGLAND

Metal Industries Group

Manufacturers of the world's widest range of industrial electronic control equipment

INDUSTRIAL NEWS (*Continued*)

by making available to all customers stocks at any branch. The new organisation will be under the joint control of Mr. H. E. Bagnall and Mr. G. Lockwood, the directors previously in charge of F. Westerman (Wholesale), Ltd., and Electro-Mechanical Supplies, Ltd., respectively.

Electrical Engineers' Exhibition

The Exhibitors' Consultative Committee in connection with the Electrical Engineers' Exhibition held its second meeting on 22nd June. Under the chairmanship of Mr. W. S. Boone (Johnson & Phillips, Ltd.), the representatives of the thirty elected companies discussed some of the problems facing exhibitors and examined complaints brought to their attention by individual exhibitors. Among the matters discussed were sectionalisation, balloting and hours of opening.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £257 10s 0d
Fire Refined 99·70%	ton £256 0s 0d
Fire Refined 99·50%	ton £255 0s 0d
COPPER Tubes ..	lb 2s 5¾d
Sheet	ton £291 15s 0d
H.C. wire and strip..	ton £305 5s 0d
LEAD, English ..	ton £70 15s 0d
Foreign	ton £69 0s 0d
MERCURY	flask £70 10s 0d
TIN, block (English) ..	ton £797 10s 0d
ZINC, G.O.B. Foreign	ton £90 15s 0d
BRASS Tubes (solid drawn)	lb 2s 0⅝d
Wire	lb 2s 10⅛d
PHOSPHOR BRONZE Wire	lb 4s 3⅛d
PLATINUM	oz £30 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 37d—37½d

Royal Highland Show

At the Royal Highland Show, Edinburgh, the advantages of electrical methods of crop drying were demonstrated on the electricity stand organised jointly by the South of Scotland Electricity Board and the British Electrical Development Association; in addition, several types of grain dryers were shown. Brooders, in which heat is stored in a large block of concrete, either free standing or set into the floor of a rearing house, were also displayed.

So far, Scottish farmers have been slow to develop the potato chitting technique (a combination of controlled lighting and ventilation used in chitting stores as an accelerator agent) and methods and examples were on view.

The Duke of Edinburgh seen discussing with Mr. W. Hutton (deputy chairman, South of Scotland Electricity Board) a method of crop conservation, when visiting the electricity stand at the Royal Highland Show. On Mr. Hutton's right is Mr. J. W. Moule (chief commercial officer, South of Scotland Electricity Board)

In the horticultural section it was demonstrated that by the introduction of correct electrical equipment spectacular savings could sometimes be achieved. An example was the installation of an electric forced draught fan unit in a solid fuel heating system, which could result in a 25 per cent reduction in the fuel bill.

American Orders for Catering Machinery

Mr. E. C. Simmonds, general sales manager of Peerless & Ericsson, Ltd., has returned from North America with orders valued at $100,000. He went initially to look after the interests of his company at the Chicago Fair, where it showed a full range of catering machinery.

Trade Announcements

A new Central Area Service Department for domestic equipment has been set up by the **General Electric Co., Ltd.**, with premises in Newhall Street, Birmingham (telephone: Central 7081). It will operate from 1st July under the management of Mr. D. W. Smith. All repairs of domestic equipment and appliances for the Nottingham, Stoke and Leicester Branch Areas of the company will be carried out at this service depot and field service calls for those areas organised from there. Spare parts for domestic equipment will continue to be available from local G.E.C. branches. The new arrangement does not affect repairs of fans and radio and television equipment which should continue to be sent to the local branch.

British Insulated Callender's Cables, Ltd., are opening their new West London depot at Silverdale Road, Hayes, Middx. (telephone: Hayes 8241), on 4th July. This depot will carry a comprehensive stock of rubber, thermoplastic and mineral-insulated cables and accessories. Mr. T. W. Hills, who will be in charge, was formerly a sales representative with the London branch.

Philco (Great Britain), Ltd., have appointed Mr. E. R. Bailey, 3, Glenavon Road, Ipswich, Suffolk, as representative for Huntingdonshire, Cambridgeshire, Norfolk, Suffolk, Essex and the East London postal districts, excluding E.C.

J. Walton (Electrical), Ltd., have opened a new branch at 2, Ashfield Road, Burnley, where a former mill warehouse has been converted into modern showroom premises and large stockrooms. Mr. J. Barlow, area manager, is in charge of the new premises (telephone: Burnley 7728/9).

Mr. G. E. More has joined the South East Region of **Philips Electrical, Ltd.**, as lamp and lighting representative for the county of Kent in succession to Mr. J. P. Skehens, who has been transferred to the Regional Street Lighting Department.

Mr. P. Conley has been appointed technical sales representative, Yorkshire and North-East Coast area, of **Ekco Heating** (E. K. Cole, Ltd., 5, Vigo Street, London, W.1.). His home address is 32, Woodhall Drive, Leeds, 5.

Cook & Nicholson, Ltd., of Wear File Works, Sunderland, have been appointed agents for North-East England by **Weldcraft, Ltd.**, of Slough. They will handle sales of gas welding equipment (and, later, also electric welding equipment) in Northumberland, Durham and the North Riding of Yorkshire.

Venesta Foils, Ltd., say that the telephone number of their new head office at Thorn House, Upper St. Martin's Lane, W.C.2, will be Temple Bar 4399.

Jones, Stroud & Co., Ltd., have appointed Mr. L. Lund as their northern representative.

Change of Name

The name of Dale Electric (Export), Ltd., has been changed to Dale Electric (Overseas), Ltd.

PARLIAMENTARY REPORT

Nuclear Power Plans

Referring to the White Paper on the nuclear power programme, the Minister of Power, Mr. Richard Wood, said in the House of Commons last week that rather than being a "cut-back" this was really a deferment of the acceleration which was planned in 1957. The acceleration would have required a high rate of ordering, he said, and all they were doing at the present time was to say that the ordering would continue to go on at about the present rate.

The Minister was replying to Mr. Lee, who suggested that it was rather sad that this cut-back in the programme of "a young, modern, public industry doing a great job of work" should have to take place. In view of the fact that they would not now receive the amount of electricity from nuclear sources which had been anticipated, Mr. Lee asked if it would not be better to review the National Coal Board's programme to ensure that Britain was not short of power by 1965. Mr. Wood said this was an important subject and it would be better if the House discussed the White Paper at some time other than during question hour. He told Mr. Peyton, who asked for an assurance that the principle of Britain having the cheapest, most economic and most efficient sources of fuel had not been dropped, that the whole reason for the change was that the point at which nuclear power generation broke even with conventional power generation would be rather further in the future than was first expected.

Mr. Price suggested that the present step had been necessitated by the remarkable technical improvements in the capital costs of conventional stations. It was important, however, that the design teams brought into being under the nuclear power programme should be kept in being. Could the Minister give some undertaking that research contracts would be given in respect of at least some of the teams?

Mr. Wood said he would take notice of that.

Experimental Reactors

Asked by Mr. Mason how many experimental nuclear reactor projects were under observation and under construction by the A.E.A., the Minister of Education, Sir David Eccles, said the Authority endeavoured to keep under observation experimental reactor projects in all parts of the world. At present they had two reactors under construction and two others had recently been completed. The former were in support of the next stage in the commercial development of the gas-cooled reactor system; the latter were experimental reactors to explore the physics and engineering of yet more advanced systems.

Relations with Euratom

Britain's relationship with Euratom was referred to by Mr. Profumo, Minister of State for Foreign Affairs, in reply to questions by Labour members. He said he was satisfied that the agreement of February, 1959, provided the basis for fruitful technical collaboration. The Continuing Committee for Co-operation, on which the Minister for Science and the chairman of the U.K.A.E.A. represented the U.K., had had a useful first meeting and there had been valuable exchanges of information in the Joint Working Group of officials of the U.K.A.E.A. and the Euratom Commission.

Anglo-Argentine Tramways

The case concerning compensation claimed by the British shareholders in the Anglo-Argentine Tramways was still before the Argentine Court, Mr. Allen, Foreign Office Under Secretary, told Mr. Teeling. The Court had not yet indicated when judgment would be handed down. The British Government had continued to make clear to the Argentine Government the importance they attached to a settlement of this dispute.

Submarine Telephone Cables

The Postmaster General informed Mr. Mason that there had been no general increase in submarine cable breaks, but following more than two years' immunity there had been four breaks in the transatlantic telephone cable system linking Britain with Canada and the United States since February, 1959. All were due to fishing trawler operations.

Television Set Exports

A suggestion that the high rate of purchase tax on television sets was a cause of Britain's "negligible" export of them was made by Mr. Nabarro during the Committee stage of the Finance Bill. He was moving a new clause to reduce the 50 per cent rate of purchase tax to 37½ per cent. The Economic Secretary, Mr. Barber, said the figures did not indicate that the products of the radio and television industry could not stand the present rate of tax, although he realised that the manufacturers would all wish that it could be reduced. The latest figures, for January and February of this year, showed that there was an increase in the production of radiograms and radio sets of 30 per cent over the same period last year and in television sets a 17·7 per cent increase. The new clause was rejected.

Block Heaters

Referring to block storage heaters, Mr. Woodburn said that at the moment the industry was threatened that if these were sold for domestic purposes purchase tax would be charged on industrial storage heaters as well. Would it not be sensible to allow these excellent heaters to be sold for domestic purposes? The Chancellor of the Exchequer (Mr. Amory) said there was no restriction by the Treasury on the sale of this equipment.

H.P. Restrictions and Employment

The President of the Board of Trade told Mr. Jay that his Department could not consult with industry about the discharge of labour due to the recent restrictions on hire-purchase trading until they were approached by the firms concerned. When Mr. Jay pointed out that Hoovers had released 400 workers in Scotland, 300 in Wales and only 100 in London where there were many alternative types of employment, Mr. Maudling said it was difficult to go into individual cases without knowing all the details. Later he added that he hoped all firms would do their best when they had to declare redundancies to see that it was done in areas where there was more work available rather than in areas of high unemployment.

Remotely Controlled Power Station

The West Country's second unmanned power station—at Lynton, North Devon—is to go into service next September. The station is similar to that installed at Princetown last year, and is for emergency use. This was announced last Tuesday by Mr. A. N. Irens, chairman of the South Western Electricity Board, when he visited Barnstaple and met the Mayor and Mayoress (Councillor and Mrs. R. M. Huxtable) and other civic leaders. He said that the plant at Lynton would be controlled over the public telephone system from Area headquarters in Bristol. The project was part of a scheme, costing £140,000, to improve the electricity service to North Devon and to provide for rural development.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

At a recent meeting of the Council of the British Welding Research Association, **Mr. J. D. D. Morgan** and **Dr. L. M. Wyatt** were appointed to the Research Board. Mr. Morgan is with the General Chemical Division of Imperial Chemical Industries, Ltd., and is the chairman of the I.C.I. Welding Panel. Dr. Wyatt is chief metallurgist of the Central Electricity Generating Board.

Dr. A. J. Amor, C.B.E., M.D., M.Sc., has been appointed medical adviser to the London Electricity Board. He was formerly medical adviser to Imperial Chemical Industries, Ltd.

Mr. J. Chapman

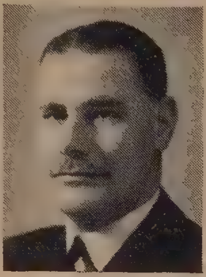
Mr. John Chapman has been appointed administrative assistant of the Electrical Development Association in succession to Mr. W. C. Spooner, who recently retired. Mr. Chapman was with the Electric Lamp Manufacturers' Association from 1948 as accountant until its dissolution in 1957, when he took up a similar post with the Electronic Engineering Association.

The Caroline Haslett Memorial Trust (General Section) has awarded travelling exhibitions to **Miss Lesley S. Souter,** B.Sc., A.R.T.C., A.M.I.E.E., and **Miss Rosina Winslade,** M.S.I.T., to enable them to study the training, employment and prospects of women engineers in the U.S.S.R.

Mr. A. S. Aldred, M.Sc., Ph.D., has been appointed senior lecturer in electric power engineering in Liverpool University.

Mr. H. G. Campbell, managing director of the Benjamin Electric, Ltd., is leaving London by air today (Friday) on a business visit to New Zealand, Australia and Canada, and will be returning to London on 27th July.

Mr. F. J. Clifton, London manager of Connollys (Blackley), Ltd., retired on 30th June on account of ill-health, after thirty-one years' service with the company. Before joining Connollys (Blackley) he served for over seventeen years with Callender's Cable Construction Co., Ltd.



Mr. F. H. Dickinson

Mr. F. H. Dickinson, M.Eng., M.I.C.E., M.I.Mech.E., M.I.E.E., who writes in this issue on the selection of sites for power stations (page 3), was educated at Oundle School and Liverpool University, receiving his practical training with the Liverpool Corporation Electric Supply Department and the Metropolitan-Vickers Electrical Co., Ltd. He began his career as shift charge engineer at Lister Drive power station, Liverpool, and in 1938 was appointed personal technical assistant to the electrical engineer (generation), London Transport, later becoming resident engineer at Neasden. In 1946 he was appointed deputy chief engineer and general manager of the Croydon Electricity Department, where he had the additional responsibility for the construction of Croydon "B" generating station. On the nationalisation of the industry, Mr. Dickinson became generation engineer (construction), S.E. Division, British Electricity Authority, with continued responsibility for Croydon "B" and also Littlebrook "B" and "C" power stations. He then joined Messrs. Preece, Cardew & Rider as senior engineering assistant and became a partner in 1952.

The annual sports and gala of the General Electric Co., Ltd., was held on 17th June at the company's sports ground at Wembley. In the photograph Sir Leslie Gamage, chairman of the G.E.C., is seen presenting the trophy which bears his name to John Colville, captain of the head office team

Mr. B. Wright, who joined the John Thompson Instrument Co., Ltd., in 1958 as its London representative, has been promoted to the position of sales manager. Mr. Wright will continue to be based at the company's London office in Kingsway, W.C.2.

Mr. John Keir, personal assistant to the managing director of the Marconi International Marine Communication Co., Ltd., has retired.

Mr. R. J. Roy

Mr. R. J. Roy, D.F.H., A.M.I.E.E., has been appointed sales manager of Lee Guinness, Ltd. After war service as a lieutenant in the R.N.V.R. he was in charge of outside installations of printing press contracts for Asea Electric, Ltd. He was later appointed by George Ellison, Ltd., to handle sales and service in the London area.

Mr. N. R. Law, manager of the Nottingham branch of Philips Electrical, Ltd., since 1940, has retired and at a luncheon party recently he was presented with a cheque from his colleagues at the London head office and in the Midlands region. The presentation was made by Mr. D. E. Beard, Midlands regional manager.

Mr. D. R. Stanley-Adams has been appointed export sales manager of the International Division of U.S. Industries, Inc., covering Europe and the Middle East.

On 18th June **Mr. H. A. Harvey,** who has been with Crompton Parkinson, Ltd., longer than any other employee, was presented with a longest-service medal. This medal is in gold and was originally presented to Col. R. E. B. Crompton, the company's founder, at the diamond jubilee celebrations in 1938. Mr. Harvey joined Crompton & Co. on 1st January, 1908, and was first employed in the making of parts for arc lamps and later in the manufacture of f.h.p. motors and ceiling fans. He now works in the Production Engineer's Department on shop layout.

Mr. J. Wiseley

Mr. J. Wiseley, commercial manager of Crompton Parkinson (Chelmsford), Ltd., who has just retired, joined Crompton's at the Guiseley, Yorks, office in 1928 and as chief accountant and registrar was responsible for much of the financial re-arrangement which followed the amalgamation of Crompton & Co., Ltd., with F. & A. Parkinson, Ltd., and the subsequent acquisition of other companies which now form part of the organisation. He moved to the Chelmsford works as commercial manager in 1940.

Mr. R. H. S. Turner, M.A.(Cantab.), chairman of the Council of the Institution of Production Engineers for 1960-61, is director and works manager of Associated Electrical Industries (Manchester), Ltd.

Mr. J. A. Pope, Ph.D., D.Sc., Wh.Sch., M.I.Mech.E., has joined the boards of Mirrlees, Bickerton & Day, Ltd., and the National Gas & Oil Engine Co., Ltd., and will be the director of the new research centre being established by Hawker Siddeley Industries, Ltd., at Stockport. Dr. Pope was appointed Professor of Civil and Mechanical Engineering at Nottingham University in 1949 and during the past four years has been responsible for the planning of the new laboratories for the Faculty of Applied Science there.

Mr. B. S. Freeland has been transferred to the staff of the chief engineer (sales) of Tufnol, Ltd., for special duties in the market research unit. Mr. Freeland has been London area branch manager since 1935 and he is succeeded in that position by his former deputy, **Mr. F. J. Griggs,** who has served with the company for twenty-eight years.

Mr. G. Robbins has joined the technical sales staff of Aveley Electric, Ltd.

The annual bowling match of the North-Western Branch of the **Electrical Trades Commercial Travellers' Association** was held on 17th June at Dunham Massey, Ches., when there was a good attendance of members and their ladies. Prizes were won by Mrs. Sinclair, Mrs. Feneley, Mr. J. B. Jones and Mr. Amer. All the arrangements for the event were made by Mr. W. E. Garratt.

Some 60 members of the **Ipswich and District Electrical Association** paid a visit last week to the studios of Anglia Television, Norwich. The programme included a tour of the transmitting mast installation at Mendlesham. At the end of the visit Mr. T. Marshall, chief engineer of the Anglia group, was thanked by the Association's chairman, Mr. R. L. Thurlow.

More than two hundred young engineers from the Rugby works of the **English Electric Co., Ltd.,** received indentures and merit awards on 25th June. Presentations were made by the chairman of the company, Lord Nelson of Stafford.

The principal English Electric award winners with (left) Mr. E. M. Price, general manager, Rugby works and (centre) Lord Nelson. The award winners are Mr. Ian McKenzie (second from left), the best graduate apprentice of the year; Mr. D. E. Palmer (fourth from left), who won the Foremen's Shield for the best craft apprentice; and Mr. Stephen A. Gaydon (right), the best student apprentice

Mr. G. T. Sandy

Mr. T. G. Sandy, M.B.E., has been appointed a director of George E. Taylor & Co. (London), Ltd., and George E. Taylor (Overseas), Ltd. In his new capacity, Mr. Sandy will be responsible for all overseas operations for George E. Taylor in the electrical and mechanical fields. He joined the company in 1935 and was previously Middle East manager and senior representative in the area for the parent company, Turriff Construction Corporation, Ltd.

Mr. S. G. Brown, A.M.I.E.E., has been appointed contracts manager of the Electrical Division of George E. Taylor & Co. (London), Ltd. He was previously chief engineer of the division, having joined the company as an apprentice in 1936.

Sir John Carmichael has been appointed deputy chairman of the Independent Television Authority.

OBITUARY

Mr. W. Cross.—The death has occurred at the age of eighty-seven of Mr. William Cross, M.I.E.E., managing director of Falconar, Cross & Co., Ltd., Newcastle-upon-Tyne, and for very many years a prominent member of the electrical contracting industry. Mr. Cross was trained at the Chelmsford works of Crompton & Co. and in 1897, in association with Mr. O. L. Falconar, formed the business bearing their joint names. He was a founder-member of the Electrical Contractors' Association and was its president in 1915-17; he was a member of the Technical Committee up to the time of his death. In 1919-20 Mr. Cross was chairman of the North-Eastern Centre of the Institution of Electrical Engineers and he was a past-member of the I.E.E. Wiring Rules and Ship Wiring Committees.

Mr. William Tancred, A.M.I.E.E., who was formerly with the London Electric Supply Corporation, Ltd., died suddenly on 20th June.

Mr. George Hunter, service centre supervisor, Lincoln District, East Midlands Electricity Board, died on 21st June at the age of sixty-four, after a short illness.

IN THE COURTS

Scottish "Undue Discrimination" Case

Giving judgment in a case that began six years ago, Lord Guest in the Court of Session, Edinburgh, on 23rd June absolved the South of Scotland Electricity Board and the British Electricity Authority from two actions involving important principles governing the method of charging for supply of high-voltage electricity to industrial consumers. The actions were by British Oxygen Gases, Ltd., Hillington and Polmadie, Glasgow, and their predecessors, the British Oxygen Co., Ltd. The case began in 1954 when the defenders were the South West Scotland Electricity Board, now superseded by the South of Scotland Electricity Board. There have been eleven separate legal debates in the action, including four appeals to the Second Division of the Court of Session and two appeals to the House of Lords. Legal expenses, it is estimated, will exceed the original sum sued for—£10,000.

The pursuers alleged that, in charging for supply to their premises at Hillington and Polmadie the South West Scotland Electricity Board, and since 1954 the South of Scotland Electricity Board, exercised undue discrimination against industrial users of electricity (including the pursuers) metered at or above 6,000 V.

Lord Guest, in his judgment, said the pursuers' attack on the tariffs was broadly made on the basis that the unit charge in each of the tariffs fixed an inadequate differential between high and low voltage consumers. The pursuers claimed repayment of any overcharge resulting from alleged undue discrimination.

When the case was last before the Lords, the defenders' argument that undue discrimination could only be judged by the price paid by the consumer was rejected. Following the House of Lords' judgment, a proof was allowed on averments that the least differential in unit charge which could be given without unduly discriminating against the pursuers was 5·55 per cent, increasing as the cost of fuel increased.

Whether discrimination was undue was a question of degree, said Lord Guest. The burden of proof rested on the pursuers. The main body of evidence led for the pursuers was directed to establishing that, from the point of view of cost of supply to the consumer, the differential as between high and low voltage consumers was inadequate. If the figure 5·55 per cent was the proper differential, his Lordship said, this was very far from establishing that it was the minimum differential. In his view this figure could not be taken as a proper differential which the defenders were bound to write into every tariff. This differential was on the basis of a price of coal of 38s per ton, which was a national price. During the period in question the price never fell below 61s 10d, and to ascertain the true differential it was necessary to look at the actual price of coal.

Lord Guest held that pursuers had failed to establish the crucial averment on which a proof was allowed, namely, that 5·55 per cent was the minimum differential as between high and low voltage consumers. The only justification claimed for the magical figure of 5·55 was that it represented the difference between the price per unit of electricity to high and low voltage consumers with coal at 38s per ton. The differentials enjoyed by the pursuers under the various tariffs were 3·24, 3·78 and 3·74 per cent. It followed that there was no undue discrimination.

His Lordship also rejected a claim by British Oxygen Gases that, in respect of a fourth tariff, they suffered undue discrimination by being charged under a monthly maximum demand tariff without having been offered the alternative of an annual maximum demand tariff, the price content of which was ten times the monthly charge. To his Lordship it appeared an impossible proposition that the pursuers should be able to dictate the form of a tariff which they should be offered and that the defenders should be bound to give the pursuers the alternative of an annual maximum demand charge without altering the money content in the monthly charge.

Under the Electricity Act the Boards were directed to secure that revenues were not less than sufficient to meet their outgoings. The revenue, it was suggested, might be made up by increasing charges to consumers other than industrial. But this, his Lordship said, might result in undue discrimination against those other consumers.

Action Against Sir Harold Bishop Fails

Upon the submission of counsel for the defence, Mr. Justice Havers on Monday last ruled that there was no case to go to the jury in an action brought by Mr. L. J. Peerless, a former B.B.C. engineer, against Sir Harold Bishop, director of technical services, B.B.C. Judgment with costs was entered for Sir Harold Bishop.

Mr. Peerless sued for damages for libel and slander alleged to have been contained in a report by Sir Harold Bishop in 1953 to Sir Ian Jacob, then director-general of the B.B.C., and in conversation with Sir Ian. Mr. Peerless said that as a consequence he had lost his position with the B.B.C.

His Lordship ruled that there was no evidence of publication and expressed his regret that the jury had had to listen for seven days to a case which they had no opportunity of deciding.

Demolition Company Fined

At Edinburgh Sheriff Court on 21st June the Capital Demolition & Construction Co., 15, Hawthornvale, Leith, pleaded guilty to having, on 2nd September, 1959, while engaged in demolishing a former printing factory, failed to ensure that certain electric cable did not remain electrically charged. In consequence, added the charge, Patrick Thomas O'Connor, builder's labourer, was killed.

Mr. Andrew Gow, an Inspector of Factories, stated that O'Connor, in the course of his work, had smashed a fuse box with a hammer and attempted to remove brass terminals. Mr. Gow said his information was that the firm made a telephone call to the South of Scotland Electricity Board and were told that the supply was in fact cut off, but that the Board would send someone to make sure. When no one arrived, the firm assumed it was all right and carried on work. The Electricity Board denied all knowledge of this telephone call. There might have been a misunderstanding. The supply to the apparatus of the building was cut off by removal of three fuses in the fuse box, but the supply to the brass terminals in the lower part of the fuse box was still there. There was no danger unless someone smashed the fuse box. He had discussed this with the Board and he understood it was not their practice to cut off the supply if there was a chance of the premises being reopened.

Mr. I. Balfour, representing the firm, alleged that a foreman of the firm phoned the Electricity Board from the offices of the Gas Board and someone gave an assurance that the electricity supply would be cut off.

Sheriff Middleton said that morally the firm had some excuse, but it was hardly good enough in matters of this kind, where there might be fatal accidents, to rely on telephone conversations. He imposed a fine of £10.

Financial Section

STOCKS and SHARES

INITIAL reactions in the Stock Exchange to the Government's further turn of the screw on credit facilities were sharply adverse, but within a day or two of the announcements market conditions were becoming distinctly harder. Although, as the accompanying tables indicate, losses among industrial shares were widespread, few of the changes were of any very serious consequence, and by the beginning of this week many quotations had made at least a partial recovery. In the gilt-edged market, however, the double impact of the higher Bank Rate and the extra restriction on the lending power of the banks left prices in deep depression.

Telephone Issue

Dealings began this week in new Automatic Telephone & Electric 5s ordinary shares, of which nearly 3½ million are offered to the company's shareholders by way of rights at a price of 15s. First transactions were at a premium of 9d, with the old shares quoted at 15s 4½d in their "ex-rights" form. The issue is related to the existence of overdrafts of nearly £2½ million in the last accounts. In the annual report the view was expressed that the telecommunications industry was emerging from the difficult trading conditions which had persisted over the past two years. Results for the present year are now expected to be no less satisfactory than those of 1959, and to justify the maintenance of the ordinary dividend at 17 per cent. On that basis the yield on the new shares at an all-in price of, say, 15s 10½d (free of stamp duty for the time being) is £5 7s 0d per cent.

Laurence Scott

Earnings of Laurence, Scott & Electromotors were rather better than maintained in last year's difficult trading conditions and again covered with an exceptionally wide margin the payment of a 15 per cent dividend, the same rate as before but applicable to capital increased by a small scrip issue. In his annual review the chairman expressed considerable satisfaction with the way in which the intake of orders grew during the course of the year and had since been maintained, despite competition. The latter was said to be severe enough to suggest the persistence of spare manufacturing capacity in the industry, and uncertainty about profit margins made reliable forecasting of prospects difficult.

Ever Ready Prospects

At the annual meeting of Ever Ready (Great Britain), Mr. E. N. Rowbotham will be reviewing a year in which earnings increased for the seventh time in succession and provided for the sixth increase in the dividend within the same period. Apart from higher sales, the chairman said in the annual report that increased

Price Changes in

Company or Board	Nom. Value	Middle price 27th June	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield %	1960 High-est	1960 Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	74½	−1	3	3	4 0 6	79½	74½
Brit. Elec. 1974/77	100	70½	−1	3	3	4 5 0	76	70½
Brit. Elec. 1976/79	100	73	−1	3½	3½	4 16 0	79½	73
Brit. Elec. 1974/79	100	83½	−1	4½	4½	5 1 9	90½	83½
Brit. Elec. 1967/69	100	91	−1	4½	4½	4 19 0	97½	91
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		6·8†	7†	10 17 3	20/9	19/3
East African Power	£1	16/6		7½	8	9 14 0	20/3	16/-
Nigerian Elec.	£1	16/6		8	8	9 14 0	19/9	15/6
Perak Hydro-Elec.	£1	17/6	−1/-	10	5	5 14 3	19/-	15/3
Electrical Shares								
Aberdare Holdings	5/-	14/6	−/-	17½	17½	6 0 9	19/-	14/6
Aerialite	1/-	8/6	−3d	54	54	6 6 6	9/6	7/6
Allen, W. H.	£1	55/-	−1/-	12	14	5 1 9	60/-	51/3
Allied Insulators	5/-	20/-		—	20	5 0 0	23/3	20/-
Anglo-Portuguese Tel.	£1	26/3	−6d	9	9	6 17 3	29/-	26/-
Arcolectric	1/-	4/3		—	15	3 10 6	5/6	4/-
Aron Elec. Ord.	£1	76/-	−1/-	15	15	3 19 0	77/6	47/-
Assoc. Elec. Ord.	£1	53/9	−1/-	15	15	5 11 6	66/6	50/6
Automatic Tel. & El.	5/-	15/4½x.r.		17	17	5 10 6	21/9	15/4½
Babcock & Wilcox	£1	36/3	−1/3	13	9	4 19 3	48/9	33/6
Bakelite	10/-	56/3		15	17½	3 2 3	56/3	40/-
Baldwin, H. J.	2/-	2/-		20	—	—	2/6	2/3
Berry's Electric	5/-	36/3		10	20‡*	2 15 3	38/-	29/6
Bowthorpe Holdings	2/-	7/9	−6d	27	18½*	4 15 3	11/6	7/9
British Elec. Traction:								
Def. Ord. "A"	5/-	43/6	−1/6	35	40	4 12 0	49/3	42/-
B.I. Callender's	£1	50/6	−1/6	31½	13½	5 7 0	61/-	50/-
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	21/-	19/9
British Thermostat	5/-	23/9		35	20*	4 4 3	26/-	21/3
Brook Motors	10/-	45/9		25	25*	4 12 6*	53/6	45/6
Bulgin, A. F.	1/-	9/6		50	55	3 17 0*	10/3	8/-
Bulpitts	5/-	17/6		15	16¼	4 12 9	23/3	17/-
Burco Dean	5/-	10/-	−1/6	16	18	—	15/9	10/-
Cable & Wireless	5/-	15/3	−9d	10	10*‡	3 5 6	18/3	14/3
Chloride El. Storage "A" ...	£1	73/9	−2/-	20	17½*	4 15 0	75/9	65/6
Clarke Chapman	£1	48/9		13¾	13¾	5 12 9	63/9	48/9
Cole, E. K....	5/-	21/3	−1/6	17½	20	4 14 0	31/9	21/3
Contactor Switchgear	5/-	16/3		14	14	4 6 3	17/9	15/9
Cossor, A. C.	5/-	6/9	−3d	Nil	5	3 14 0	10/-	6/9
Crabtree	10/-	24/-		20	22½‡	4 13 9*	28/3	24/-
Crompton Parkinson	5/-	12/6	−9d	12	14	4 9 9*	15/-	11/9
Davis & Timmins	5/-	23/-		20	25	4 7 0*	23/-	17/-
De La Rue	10/-	74/6	−1/-	20	22½	3 0 6	77/6	62/-
Decca "A"	10/-	45/-	−1/3	50	20*	4 9 0	51/3	42/-
Desoutter	5/-	43/-		21⅜	30	3 9 9	42/-	37/6
Dewhurst	2/-	7/6		20	20	5 6 9	8/6	7/6
Dictograph Tel.	2/-	8/6	−6d	20	20	4 14 3	9/9	8/6
Dimplex	5/-	31/9	−9d	—	25‡	3 18 9	32/6	26/9
Dubilier Condenser	1/-	5/6		20	25	4 11 0	6/-	5/-
Duport	5/-	23/9	−1/9	12½	17½	3 13 9	30/3	22/-
E.M.I.	10/-	50/-	+3/-	20	14*‡	2 16 0	58/9	45/-
Electrical Apparatus	5/-	16/6	+6d	14½	14½	4 8 0	16/6	12/9
Electrical Components	5/-	9/9		12½	15	5 2 6*	13/9	9/6
Elec. Construction	£1	35/-	−1/3	9	9	5 2 9	43/-	35/-
Elliott-Automation	5/-	25/-	−1/-	—	9·3*	1 17 6	26/-	19/9
Enfield Rolling Mills	£1	54/-	−6d	15	15	5 11 0	56/3	48/-
English Electric	£1	37/3	−6d	14	10*	5 7 6	53/-	36/3
English Electric 3¾% Pref. ...	£1	11/-	−1/-	3¾	3¾	6 16 3	13/-	11/-
Ericsson Tel.	5/-	22/6		13†	13†	4 14 3	28/6	22/6
Ever Ready	5/-	27/-	−6d	27½	20*	3 14 0	27/6	23/-
Falk Stadelmann	£1	31/6		10	10	6 7 0	35/9	31/6

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

efficiency in production methods contributed largely to the results, and had also enabled the company to continue the established policy of reducing retail prices of some of the products with the object of further stimulating sales at home. On the export side the group is strengthening its position on the Continent and the outstanding commitments for capital expenditure of over a million are largely related to that field. In the current year sales at home and abroad were said to be running above the levels of a year earlier and trading was described as encouraging. The 5s shares have been in good demand and at 27s show a yield of nearly 3¾ per cent on a dividend covered 2½ times over.

Electrical Investments

Company or Board	Nom. Value	Middle price 27th June	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1960 Highest	1960 Lowest
Electrical Shares—continued						£ s d		
G.E.C.	£1	35/3	−2/6	10	10	5 13 6	47/6	35/3
G.E.C. 6½% Pref.	£1	20/6		6½	6½	6 6 9	22/3	20/6
General Cables	5/-	5/9		15	Nil	—	10/-	5/9
Goblin (B.V.C.)	5/-	8/-		7½	12½	7 16 3	13/9	8/-
Hackbridge Holdings	5/-	15/3	−6d	20	20	6 11 3	17/3	15/-
Hackbridge & Hewittic	5/-	14/6	−3d	20	20	5 3 6*	15/-	13/-
Head Wrightson	5/-	20/9	−1/9	20	14*	3 7 6	31/6	20/9
Heatrae	2/-	11/-	−1/-	20	22½	4 1 9	12/3	8/9
Holophane	5/-	17/-	−3d	22½	26	7 13 0	20/6	17/-
Hoover	5/-	46/-		60	90	4 17 9*	55/-	45/-
Intl. Combustion	5/-	27/9	−6d	30	30	5 8 0	46/9	26/6
Intl. Computers & T.	£1	63/9	−2/6	—	10	3 2 9	78/6	61/6
Johnson & Phillips	£1	20/-	−1/3	5	Nil	—	24/-	19/6
Laurence Scott	5/-	19/9	−3d	15	15*	3 16 0	25/3	18/-
Lister, R. A.	£1	54/-	−6d	12½	14	5 3 9	62/-	52/6
Lucas, J.	£1	68/9		10	12½	3 12 9	74/6	65/-
Marryat & Scott	2/-	15/-		37½	22½*	2 19 0	16/9	14/3
Mather & Platt	£1	46/3	−1/3	10⅜	11	4 15 3	59/-	46/3
Metal Industries	£1	63/-		14	15‡	4 15 3	76/3	61/3
Midland Elec. Mfg.	£1	57/6	−1/3	10	12	4 3 3	58/9	53/6
Morphy-Richards	4/-	21/9		20	25	2 6 0*	23/6	16/3
Murex	£1	66/3	−2/6	17½	15	4 10 6	77/-	62/6
Newman Ind.	2/-	5/-		10	12½	5 0 0	5/3	4/-
Oldham & Son	1/-	3/-	−3d	17½	17½	5 16 9	3/3	2/9
Parsons, C. A.	£1	51/3	−2/6	8⅛	9⅜	3 13 3	59/-	46/-
Philips' Lamps	Fl.10	235/-	+5/-	13·3	16	1 7 0	£12¼	137/-
Plessey	10/-	50/-	+1/-	20	14*‡	2 16 0	54/6	44/3
Pye	5/-	15/9	−3d	12½	15	5 1 9	19/-	14/9
Pyrotenax	5/-	52/-	−3/-	—	34	3 5 6	56/-	44/3
Radiation	£1	34/3	−9d	6	12	7 0 3	44/6	34/3
Reliance Clifton	5/-	23/6		15	15	3 3 9	28/-	22/-
Reyrolle	£1	39/3	−9d	17½	17½	4 9 3*	52/3	38/-
Rheostatic	4/-	16/-	−1/-	20	18¾*‡	4 13 6	17/-	12/6
Richardsons Westgarth	10/-	9/9	−6d	8⅓	8⅓	8 10 6	14/9	9/9
Sangamo Weston	10/-	21/-		12½	11*	5 4 9	22/9	19/3
Simon-Carves	5/-	44/6	−1/9	25	35	—	54/-	36/-
Smith (England), S.	4/-	17/-	−1/-	12½	17½	4 2 3	20/-	16/-
Southern Areas	£1	15/-		Nil	5	6 13 3	15/6	13/-
Strand Elec.	5/-	16/3		15	20	6 3 0	20/3	15/9
Sturtevant	5/-	15/–	−9d	15†	15†	8 4 0	24/3	15/-
Sun Elec.	5/-	15/9		25	15*	4 15 3	16/3	15/-
Switchgear & Cowans	5/-	16/-		15	17½	5 9 6	18/9	16/-
T.C.C.	10/-	46/3		25	35	5 1 0*	48/3	37/3
Telephone Mfg.	5/-	6/-	+3d	10	5	4 3 3	7/3	5/-
Telephone Rentals	5/-	20/9		12½	15*	3 12 3	20/9	17/-
Thompson (John)	5/-	17/-	−9d	25	20	5 17 9	25/9	17/-
Thorn Elec.	5/-	48/3	−3/3	17½	20	2 1 6	55/6	44/3
Thorneycroft	£1	24/9	−3d	7½	6	4 17 0	31/-	23/-
Tube Investments	£1	75/-	−3/9	20	13‡	3 9 6	95/6	65/3
Vactric	5/-	25/-	−2/6	25	37½	7 10 0	43/9	25/-
Walsall Conduits	4/-	13/3	−6d	22½	15*	4 10 6	16/-	13/3
Ward & Goldstone	5/-	58/-	−2/-	30	35	3 0 3	60/-	51/3
Watford	2/-	11/-		25	25	4 11 0	17/6	11/-
Westinghouse	£1	47/-	−3/-	10	11	4 13 6	59/9	47/-
West, Allen	5/-	12/6	−6d	12½	12½*	5 0 0	17/-	12/6
Wilkins & Mitchell	5/-	19/3	−9d	15	17*	4 8 3	25/9	19/3
Wolf Electric	5/-	13/-		10	12½	4 16 3	13/3	10/9

Electronic Trust Issue

Some £470,000 new capital has been raised through a recently completed issue of new £1 ordinary shares by the Electronic Trust, whose directors expressed at the time the view that ample scope existed at home and in the United States for further investment in the fields of electronics, automation and nuclear power, notwithstanding the rise in the price of many suitable shares. They have just declared a dividend of 4 per cent on present capital for the year ended last May, and expect to recommend the same rate next time on capital increased to £1,875,000 by the new issue. For 1958–59 there was a dividend of 3½ per cent. At the end of that period the company had about 140 holdings with a market value of over £2¼ million, of which rather more than half was represented by investments in North America. At a price of 28s the £1 old shares give a yield of approximately £2 17s 0d per cent.

Allen West Meeting

At the recently held 51st annual meeting of Allen West & Co. the chairman confirmed the statement issued with the report to the effect that prospects were much brighter than they had been a year earlier. Last year's earnings were affected to the extent of £150,000 by a previous fall in the level of orders, but the latter went up by 16 per cent over the latest period and Mr. W. H. Lancaster described the current unexecuted order position as higher than it had ever been. He was unable to foresee the effects of the shorter working week now in operation but reported an encouraging increase in output so far this year. The 12½ per cent dividend (which has been supplemented by a 1 per cent golden jubilee bonus) comes from earnings equivalent to some 22 per cent on the ordinary capital and gives a yield of 5 per cent from the 5s shares at a price of 12s 6d.

Telephone Equipment Order

An order for £500,000 worth of telephone equipment has been received by the A.E.I. Telecommunications Division from the Australian Post Office. It covers trunk telephone switching and voice-frequency signalling equipment for the automatic trunk switching system. Delivery will commence early in 1961.

REPORTS and DIVIDENDS

Ferranti, Ltd.—Record outputs were achieved by the electronic computer, power transformer and electricity meter departments in the year ended 31st March, 1960, when group net profits increased from £1,104,572 to £2,123,390 after tax of £1,854,000. The dividend on the privately held £2 million ordinary is again 6 per cent, taking £73,000.

The group net profit was arrived at after taking into account a net profit of £208,247 of subsidiaries in North America against a previous net loss of £29,157.

To the net profit is added £100,000 unrequired tax provisions. General reserve is allocated £1¾ million (£950,000) and £69,400 tax relief on investment allowances is placed to capital reserve. The group carry forward is £541,882 (£297,142) and that of the parent company £309,517 (£273,024).

The computer department, in addition to the achievement in output, also recorded its highest sales input figure since it delivered the world's first commercially available electronic computer ten years ago.

W. H. Allen, Sons & Co., Ltd.—The 60th annual general meeting will be held on 13th July. In his statement the chairman, Mr. Kenneth Allen, says that the output for the year was slightly greater than in 1958 despite the fact that they called for less help from sub-contractors. The modernisation and expansion programme is now nearing completion and this has enabled a more liberal dividend policy to be adopted.

In view of the substantial capital expenditure of recent years and the growth of the company's working capital, largely financed by retention of profits in the business, the directors are of the opinion that the issued share capital should be brought more into line with the capital employed in the business. Accordingly they are recommending the issue to shareholders of one new ordinary share credited as fully paid in respect of every two ordinary shares now held. This will be effected by way of capitalisation of part of the reserves.

If the company's trading continues as at present, it is the intention to recommend dividends in respect of the current year totalling not less than 10 per cent (less tax) on capital as increased by the scrip issue, which would be equivalent to 15 per cent on the present ordinary share capital.

Examples of new developments of electrical machinery are new self-regulating alternators which are being supplied in ever-increasing quantities and the complete electrical equipment, including a 1,250 h.p. motor for the cutter, for the largest cutter dredger to be built in Europe. It has been decided to provide a new research centre and to improve the laboratory.

With the demand for capital goods continuing at a lower level than that experienced until approximately two years ago, with a considerable portion of the capital goods manufacturing capacity of the country not fully utilised and with greater international competition, it is inevitable, Mr. Allen says, that order books are not so full and that long order books and long deliveries are not to be expected. Indeed, new business can be attracted only if short deliveries can be offered together, of course, with competitive quality and prices. All sections of the company will be fully employed throughout 1960. The value of orders booked in the early part of this year is greatly in excess of that for the same period during the two preceding years.

Industry is exhorted to expand and to reduce selling prices and to do the latter notwithstanding the effects upon manufacturing costs of increases in wages, or a shorter working week, often resulting in a greater number of hours at overtime rates. There must be a reasonable level of profit, not only for expansion and modernisation but also for essential activities such as research and training.

Referring to the Restrictive Trade Practices Act, Mr. Allen says that to ensure that practices are not against the public interest is desirable. On the other hand, nothing could be more against the public interest than to prevent reasonable commercial co-operation between companies if this leads to expansion, modernisation, research, technical progress, and an increase in the number and quality of trained engineers, none of which is possible without adequate profit which could be affected adversely by cut-throat competition.

Belliss & Morcom, Ltd.—A group loss of £144,990 was incurred in the year ended 31st March last, compared with a previous profit of £89,287, and no final dividend is recommended, against 4 per cent. The interim was cut from 4 per cent to 3 per cent. With the 1958-59 final dividend holders received a special 2½ per cent distribution, tax free, from a surplus on sales of investments. In their report the directors state that the past year was a difficult one for all capital goods industries and while there appeared to be reasonable chance of securing profit for the year as a whole, certain prospective orders did not materialise. It was decided to maintain the present complement of employees and, with a lower level of order intake than expected, that led to a fall in productivity and with expenditure remaining fairly static, to a loss. Order intake has improved this year and in addition certain changes are being made in the sales organisation so that the company should return to a profit-earning basis during the current half-year.

Crediting recoverable tax of £18,665 (£45,959 charged), the net deficit of £126,325 compares with a previous profit of £43,328. Other credits include a surplus of £38,985 on sales of investments (£28,723 plus £8,100 profit on fixed asset sales) and an excess tax provision of £1,438 (£489).

After placing £38,985 (£21,966) to general reserve and providing for preference and ordinary dividends £134,262 (£273,996) is carried forward.

The Electric & General Investment Co. announces a rights issue of 100,000 £1 ordinary shares at 40s each. They are offered on the basis of one for every eight £1 ordinary shares held on 10th June. Any shares not taken up will be sold and the net proceeds distributed to entitled holders. The new shares will not rank for the final dividend now announced but it is hoped to maintain the present rate of dividend on the increased capital.

Metal Industries, Ltd., announces that its recent rights offer of 1,479,600 new ordinary shares, at a price of 54s each, was accepted by ordinary shareholders to the extent of 98 per cent. The shares not taken up have been sold at a premium in accordance with the terms of the offer.

The Marconi International Marine Communication Co., Ltd., proposes to issue 993,939 registered shares of £1 each in capitalisation of reserves. Subject to the passing of the necessary resolution on 20th July, the new shares will be allotted, credited as fully paid, in the ratio of two for every three held on 4th July.

Geo. W. King, Ltd.—The net profit for the year to 31st December last was £132,926 (against £105,346) after charging £132,355 (£100,811) tax. It is proposed to pay a dividend of 12½ per cent on capital increased by a one-for-five scrip issue (against 12½ per cent on the smaller capital).

[*Continued on page* 37

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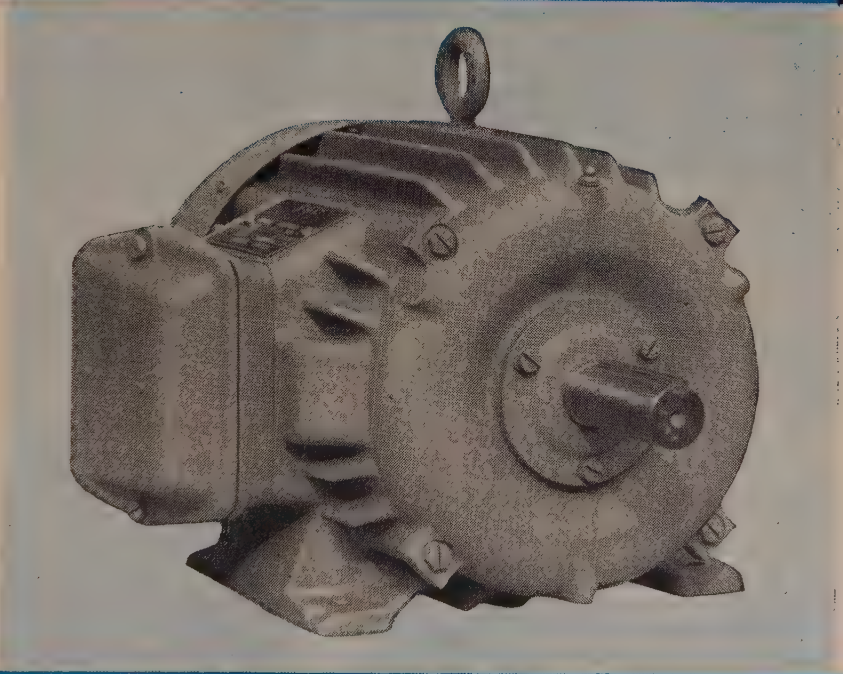

for further details, please write to:

G.E.C.

THE GENERAL ELECTRIC CO. LTD. OF ENGLAND

ROTATING PLANT DIVISION, WITTON, BIRMINGHAM 6
Telephone: EASt 1941   Telex: 33 - 323
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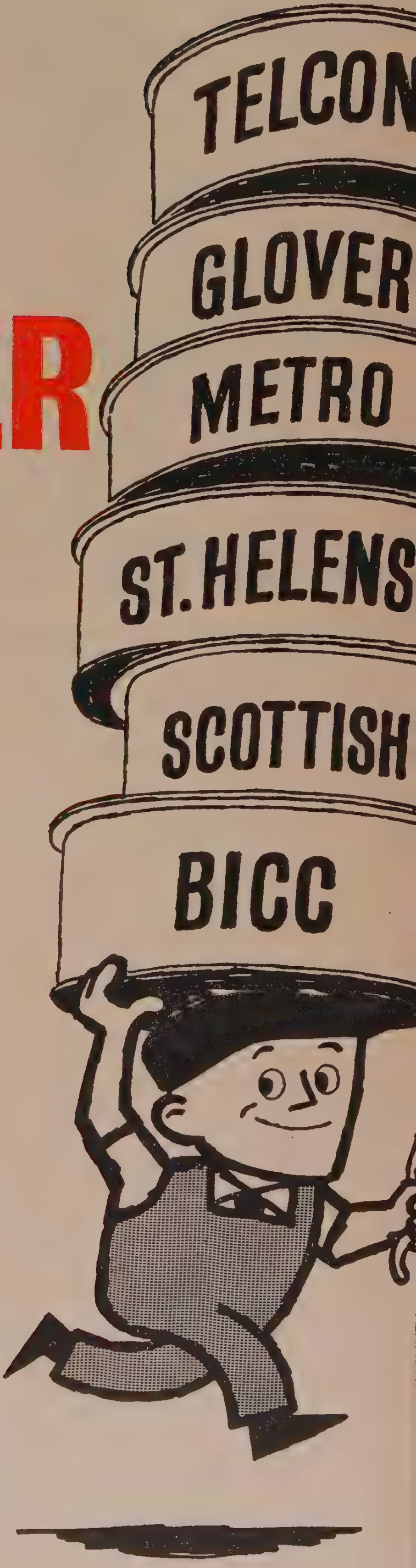


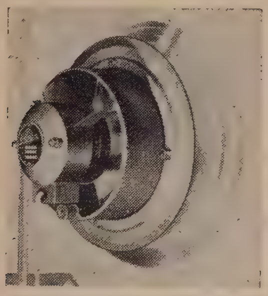
NEW ELECTRICAL EQUIPMENT

Silicone Grease

The silicone grease, M.494, added to the range of ICI Nobel Division silicone products, has good electrical qualities which, coupled with the silicone characteristic of water-repellency, give it high efficiency as a sealing agent for electrical equipment. It has already been employed in many specialised applications which include the protection of insulation from corona discharge, sealing and potting electronic equipment and lubricating electric cable prior to its being drawn through conduits, harness, etc. Further particulars can be obtained from IMPERIAL CHEMICAL INDUSTRIES, LTD., Nobel Division, Silicones Department, Stevenston, Ayrshire.

Extractor Fan

A sturdily built extractor fan suitable for domestic use has been introduced by HILLMAN ELECTRIC MOTORS, LTD., Crane Grove, Highbury, London, N.7. Easy to install, the "Comet" can be fitted into any normal window, requiring an aperture of only 8in diameter. The 6in blade of the fan is claimed to give efficient ventilation without draughts, due to a fixed metal cover which completely shields the exterior of the fan. It is fitted with a silent running 25 W a.c. shaded pole motor and models are available for the 200/220 or 220/250 voltage ranges.

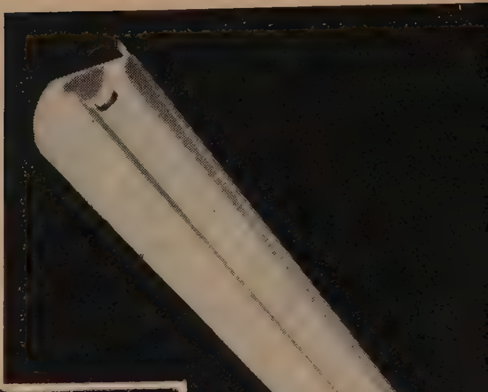


Hillman Electric Motors "Comet" extractor fan

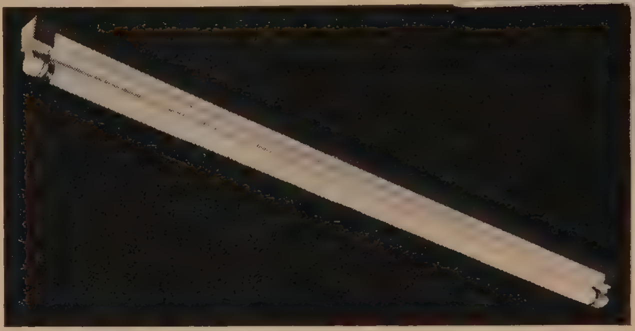
The construction is of rustproof alloy finished in either cream or white, and self-lubricated bearings avoid the need for maintenance. The price is £6 12s 6d.

Fluorescent Fittings

A simplification of fluorescent fitting design has enabled the REVO ELECTRIC CO., LTD., Groveland Road, Tipton, Staffs., to market at highly competitive prices a new fitting with features hitherto only available in the more expensive ranges. Named the "Uti-Lite," it is available at 5ft 80 W or 4ft 40 W single lamp models, the prices being £3 17s 6d and £3 5s respectively.



Above: Revo "Uti-Lite" fluorescent reflector fitting



Left: Fluorel "Super-Slim" fluorescent fitting

The white stove-enamelled steel channel houses the detachable gear tray with polyester control gear. The bi-pin lampholders and their decorative covers are moulded in white plastic. To convert the batten to a reflector fitting the lampholders are merely passed through the bridges in the top of the channel, the channel is inverted and the reflector attached with two screws. In either form the channel is designed to allow the four most common forms of suspension, by chains or direct to the ceiling, by conduit tube or direct to a B.S. conduit box.

FLUOREL, LTD., Midland Road, Leyton, London, E.10, announce their latest design in fluorescent lighting fittings, the new "Super Slim." It is a 5ft 80 W batten fitting finished in white with a light grey gear channel. The spring loaded bi-pin lampholders make for easy lamp replacement and the price is £3 18s.

Amplifier Relay

A fully transistorised printed circuit amplifier relay for use as a stable, sensitive temperature controller has been introduced by HONEYWELL CONTROLS, LTD., Ruislip Road East, Greenford, Middlesex. With the appropriate thermistor temperature sensor, the R7079/7081 "Versa-Tran" can be used for control in the range of −60° to +500°F with a differential of 1·5°F or 0·3°F, depending on the model. Control is very stable and errors due to ambient temperature conditions are easily compensated for by a calibration dial. The wiring between sensing element and relay need not be shielded and the bridge presents no capacity balance problems: ordinary 18 s.w.g. two-conductor insulated cable will suffice. The control, which incorporates the load relay, can be used up to 300ft from the thermistor and operates from the 240 V 50 c/s supply.

Milk Urn

A new one-gallon milk urn suitable for use in coffee houses and snack bars has recently been developed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. Milk is kept in a "Pyrex" glass container heated by hot water enclosed in a stainless steel outer case. The water is heated by a 1 kW sheathed wire immersion element to a tempera-

G.E.C. model H.094 milk urn

ture maintained by a pre-set thermostat housed in a stainless steel tube. The milk reaches the maximum temperature of 170-180°F in approximately 60 minutes.

The element, controlled by a 10 A on/off rotary switch, is protected by an automatic cut-out should the urn be switched on with the water container empty. The water level, however, can be checked by a gauge on the side of the unit. The urn is fitted with a large bore tap to enable milk to be drawn off and an outlet is provided for emptying the container of water. The price of the model H.094 milk urn is £48 10s.

Glass Fibre Laminate

A low cost glass fibre matt/polyester resin laminate containing flame retardant filler is being produced by Permali, Ltd., Bristol Road, Gloucester.

It is normally supplied in sheet form, with a standard size of 34in by 34in, and is recommended for busbar supports, phase barriers, arc barriers, operating levers, terminal strips, switch plates, armature end cheeks, slot wedges, coil end cheeks, contact bases and mechanism covers.

The material is claimed to match the established electrical and mechanical properties of polyester glass fibre materials at a lower cost and also lend itself to cold punching for the faster and cheaper production of shaped parts.

Portable Saw

The latest product of Wolf Electric Tools, Ltd., Pioneer Works, Hanger Lane, London, W.5, is the "Sixty Five" 6½in portable saw, a low priced saw suitable for industrial use. Its adjustable soleplate provides for a maximum depth of cut of 2⅛in and bevel sawing can be done up to 45°. A variety of blades are available for cutting wood, wallboard, asbestos, aluminium, etc. The full-load speed of the saw blade is 3,600 r.p.m. and the electricity consumption is 600 W. The overall length is 10⅜in and the weight is 8 lb 14 oz. Models are available suitable for operation on 100/110, 110/130, 150/160, 200/220, 220/250 V d.c. and a.c. The price is £16 19s 6d.

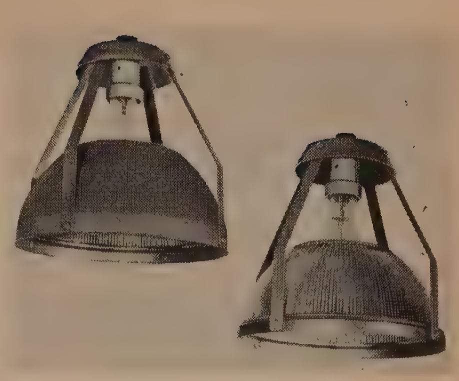
Wolf "Sixty Five" portable saw

Printed Circuit Gold Plating

A newly developed acid hard gold bath announced by Johnson, Matthey & Co., Ltd., is said to produce gold deposits of optimum durability on most grades of printed circuit and to eliminate failure of the laminate bond caused by the high free cyanide content of conventional plating solutions. Gold electrodeposited from the new bath has a Vickers hardness in the range of 120-130. It is supplied as a concentrated solution, which is diluted to make up the plating bath. Insoluble anodes of platinum or platinum-plated titanium are used. The bath should be contained in glass, earthenware or plastic vats. Relatively stress-free deposits are obtained by operating the bath at 50°C or above with a current density of not less than 3 A/sq ft. The weight deposited is 5·15 gm/Ah.

Industrial Lighting

A new range of heavy duty prismatic high-bay lighting fittings is now available from Holophane, Ltd., Elverton Street, London, S.W.1. They are covered types for application in steelworks, heavy engineering plant and large assembly shops, etc., providing efficient optical light control with the 1,000 W MB and MBF mercury and mercury/fluorescent discharge lamps.



Holophane high-bay lighting fittings—covered and translucent units

A cast metal canopy protects the lampholder with four straps supporting a steel cover and ring on which the prismatic reflector is mounted. The top entry is tapped for 1in conduit. Three types of prismatic glass reflector can be employed with the same basic design of fitting to provide alternative light distribution characteristics in the range of 400/1,000 W discharge lamps and 1,000/1,500 W tungsten filament lamps. The fittings measure 15¾in in diameter and are between 17 and 19¼in high. The weight is 17/18 lb.

Translucent fittings are also available, providing a semi-direct distribution between extensive and focusing, according to choice of reflectors, and an upward component of light for lofty mounting heights. For these the lamp ranges are 300/1,500 W g.l.s. and 400/1,000 W mercury discharge. They measure between 12½ and 15¾in in diameter and between 14¼ and 19¼in high. The weight is 10/15 lb.

CATALOGUES AND LISTS

CABLES.—Guide to the handling and installation of "Telcon" helical membrane cables and leaflets on injection moulding equipment for joints in plastic cables and "Telcleat" moulded cable cleats.—**Telegraph Construction & Maintenance Co., Ltd.,** Mercury House, Theobald's Road, London, W.C.1.

Catalogue of p.v.c. and polythene insulated wires and flexibles for the radio, television and electronic industries.—**Wandleside Cable Works, Ltd.,** 106, Garratt Lane, Wandsworth, London, S.W.18.

ELECTRONIC COMPONENTS.—Catalogue covering a range of miniature electronic components.—**Ardente Acoustic Laboratories, Ltd.,** 8-12, Minerva Road, London, N.W.10.

FANS.—Illustrated 28-page catalogue (33) dealing with "Tornado" p.v.c. fume removal fans and a 36-page catalogue (12) covering short cased axial fans.—**Keith Blackman, Ltd.,** Mill Mead Road, London, N.17.

Catalogue (2804) describing type BAVA aerofoil bladed fans.—**Sturtevant Engineering Co., Ltd.,** Southern House, Cannon Street, London, E.C.4.

INSTRUMENTS.—Catalogue illustrating the company's precision electrical instruments and leaflets on an automatic recording wave analyser and a precision r.m.s. decade voltmeter.—**Muirhead & Co., Ltd.,** Beckenham, Kent.

Three leaflets dealing with miniature "Circscale" moving iron and moving coil ammeters and voltmeters and "Edgewise" moving coil ammeters and voltmeters.—**Record Electrical Co., Ltd.,** Broadheath, Altrincham, Cheshire.

PANELS.—Leaflet illustrated in colour and detailing services which the company can offer in designing and fabricating panels for all types of instruments.—**Millett, Levens (Engravers), Ltd.,** Stirling Corner, Barnet By-Pass, Boreham Wood, Herts.

SERVO COMPONENTS. — Brochure giving particulars of d.c. motors, synchros and servo components.—**R. B. Pullin & Co., Ltd.,** Phœnix Works, Great West Road, Brentford, Middlesex.

SOUND REPRODUCTION.—Series of thirteen leaflets covering various types of microphones and amplifiers.—**Standard Telephones & Cables, Ltd.,** Connaught House, Aldwych, London, W.C.2.

TRANSISTORS.—Leaflet on Mesa high speed switching transistors and a high-voltage switching transistor.—**Associated Electrical Industries, Ltd.,** 155, Charing Cross Road, London, W.C.2.

WATER HEATER.—Brochure in colour describing the "Lidomatic" electric hot water systems.—**Heatrae, Ltd.,** Heatrae Works, Norwich.

GENERATION AND DEVELOPMENT

Sites for Coal-fired Power Stations

The Central Electricity Generating Board stated last week that, provided the Minister of Power gave permission, it could build enough coal-fired power stations to make good the cut in the nuclear power programme and to cater for the growth in demand in 1965 and 1966. Tenders for generating plant were already being sought.

The Board pointed out that the full cut in nuclear construction was apparently to fall on its share of the programme, which would be reduced from 4,475 MW to 3,175 MW by the end of 1966. This meant that previous plans for coal-fired plant for the years 1965 to 1966 must be increased by 1,300 MW.

Moreover, during the past year forecasts of load for these two years had been substantially raised "so that on both counts a much more vigorous programme of construction of coal-fired power stations is necessary than the Board anticipated a year ago."

Applications were made earlier this year for statutory consent for a number of coal-fired plants, including two very large new stations near the East Midlands coalfields at West Burton and Holme Pierrepont (near Nottingham), each of 2,000 MW capacity—equivalent to four nuclear stations of the largest size so far ordered—and a somewhat smaller new station of 1,400 MW capacity at Tilbury.

C.E.G.B. Contracts

The Central Electricity Generating Board has placed contracts during the past month for power stations, transmission lines and transforming stations amounting in the aggregate to approximately £3,619,000. They include the following:—

Trawsfynydd nuclear power station (Merionethshire): Civil works at 275 kV substation.—Yorkshire Hennebique Contracting Co.

Rheidol hydro-electric power station (nr. Aberystwyth): Northern aqueducts.—G. Dew & Co.

Thorpe Marsh power station (nr. Doncaster): Two 120 MVA, 275 kV inter-bus transformers and two earthing transformers.—Ferranti.

Uskmouth "B" power station (nr. Newport, Mon.): Main lighting, heating and socket-outlet installation.—London Electricity Board.

Aberthaw power station (nr. Barry, Glam.): One 120 MVA generator transformer.—Fuller Electric.

Leatherhead high voltage laboratory: Main civil engineering works.—M. J. Gleeson (Contractors).

West Thurrock power station (nr. Grays, Essex): Booster pumps, and starting and standby boiler feed pumps. —Sulzer Bros. (London).

Kingston substation: Four 45 MVA, 132/33 kV transformers.—Hackbridge & Hewittic Electric Co.

Iver substation: Two 40 MVA synchronous condensers and exciters. —Associated Electrical Industries.

Lydd substation (Kent): 275 kV switchgear.—A. Reyrolle & Co.

Control Boards for Trawsfynydd

Lancashire Dynamo Nevelin, Ltd. (Metal Industries Group), have received a letter of intent from Atomic Power Constructions, Ltd., stating they are to receive an order worth £50,000 for two main reactor rod control boards for installation at the new nuclear power station at Trawsfynydd, in Wales. These will control the power supplies that lower and raise graphite rods into the reactors. Both boards will be approximately 100ft long.

Inquiry into Transmission Scheme

At a Ministry of Power inquiry at Jarrow (Co. Durham) into a proposal by the C.E.G.B. to erect an overhead line from the River Tyne to Boldon substation, a distance of 3½ miles, it was stated that the cost of placing the cable underground would be £1,167,000. The inquiry was held by Mr. A. H. F. Linton, a Ministry inspector.

Mr. S. B. R. Cooke, for the C.E.G.B., said the Board proposed to construct a 275 kV line from Blyth power station (Northumberland) to Lackenby (North Yorkshire), a distance of about 50 miles. The section from the Tyne to Boldon was the only part which had raised planning difficulties. The cost of an overhead line, supported on towers 136ft high and about 1,200ft apart, would be £23,500 a mile. The ground clearance would be 25ft, with 20ft allowed over buildings. Four alternative overhead line routes had been suggested, but all the objectors had raised the question of underground cable. Owing to the cost, this was not a practicable proposition.

Replying to Mr. A. Stansfield, deputy town clerk of South Shields, Mr. Cooke said that the cost of an underground cable would include £20,000 a mile for excavating. The Generating Board had not considered placing the cable on the ground in open country, protected from the public, as this would not be a desirable plan.

Mr. Stansfield said an overhead line would ruin the Simonside housing estate. The Corporation felt that the cable should be underground, and contended that the cost would not be high in relation to the money already spent on housing.

Helicopters for Overhead Line Inspection

The South of Scotland Electricity Board is considering the use of helicopters instead of teams of "infantry" linesmen to cover its territory on inspection tours. After a tour from Strathaven, Lanarkshire, on 20th June, an official of the Board said: "My report will be in favour of using helicopters. With one man on board you can cover more territory in four hours than 26 men working a week."

Street Lighting Co-ordination

The Ministry of Transport has told the Association of Municipal Corporations that it has been "much interested and encouraged" by reports indicating that local authorities responsible for street lighting in the areas of Manchester, Bradford and Leeds have had talks which may lead to the formation of consultative committees on somewhat similar lines to that already functioning in London.

The Ministry says: "Greater co-ordination in the lighting of traffic routes passing through adjacent local authority areas is something to which we attach great importance."

Developments in Fife

When the new power station at Kincardine-on-Forth is in full production with five generating sets in operation, it will use two million tons of coal a year—about one-third of the 1959 output of the East Fife, West Fife, and Alloa areas of the National Coal Board. This was stated at Kirkcaldy on 21st June by Mr. G. T. Allcock, Fife Area manager of the South of Scotland Electricity Board. Mr. Allcock, who was speaking at a luncheon preceding the opening of the new Raith substation in Links Street, Kirkcaldy, also remarked that there was a proposal that the Electricity Board might take

[*Continued on page* 41

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AP 29

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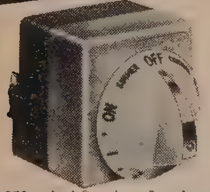

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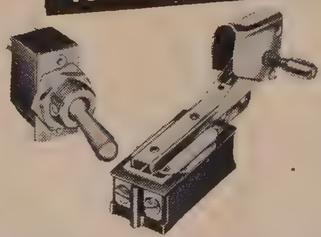

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GENERATION AND DEVELOPMENT
(*continued*)

over the National Coal Board's power station at Kelty and that another power station might be built in Fife, Methil having been mentioned as a possible site. This new station, which would use washery slurry coal, would produce 60 MW.

The Raith substation was officially opened by Provost J. W. M. Gourlay, who switched on its two 10,000 kVA transformers.

The new substation will supply the southern half of the "old town" area where the 6·6 kV system is being converted to 11 kV to bring it into line with the system supplying the "new town" area. The supply for the northern portion will be increased to 11 kV within three or four years. The whole of the work, including the construction of Raith substation, is estimated to cost £110,000.

"Son et Lumière" at Grammar School

Over 3,000 people are estimated to have attended the first night performance of a *Son et Lumière* display held at the King Edward VII Grammar School at Melton Mowbray. The lighting was provided by Atlas Lighting, Ltd., and the 50 min sound track, which included acting and music to trace the school's 50-year history, was recorded by Messrs. Westmorlands. The lighting techniques used were similar to previous Atlas schemes, using manually operated thyratron dimmers for blue, red and gold fluorescent tubes, together with high intensity incandescent sources.

Batteries for Hinkley Point

Eight large stationary batteries, together with mercury arc and selenium rectifier charging equipment, some being of English Electric manufacture, are being supplied by Pritchett & Gold and E.P.S. Co., Ltd., to the order of the consortium comprising English Electric, Babcock & Wilcox and Taylor Woodrow, for the nuclear power station at Hinkley Point, Somerset. To safeguard the equipment in the event of an emergency, each of the two reactors will have a standby battery capable of supplying a load of 730 kW, at a nominal voltage of 440 V, for 15 minutes. For each reactor a battery comprising 984 high performance cells connected in series-parallel and having a capacity of 1,200 Ah at the 10 hr rate of discharge will be installed. These batteries will supply the power for all reactor essential services during the 15 min period allowed for starting up the standby diesel engines.

Emergency lighting will be provided by a 240 V 2,000 Ah battery, which, apart from supplying an 80 kW emergency lighting load for 2 hours, will also start the essential d.c. motors for the main turbines and meet various switch-closing loads. Other batteries are being supplied for indicating lamps, switch operation and telecommunications.

Electricity and Tourists

The recently formed Western Isles Tourist Association is asking the Scottish Tourist Board to impress upon the Secretary of State for Scotland the importance of giving a special grant to the North of Scotland Hydro-Electric Board for the electrification of North Uist and Barra.

OVERSEAS

Expansion in Victoria

The State Electricity Commission of Victoria plans to spend £29 million on new capital works in 1960-61. The S.E.C. now supplies 720,000 homes from public mains. New consumers are being connected at the rate of 30,000 a year, and two-thirds of these are outside the Melbourne metropolitan area. Eleven new farms are connected each working day.

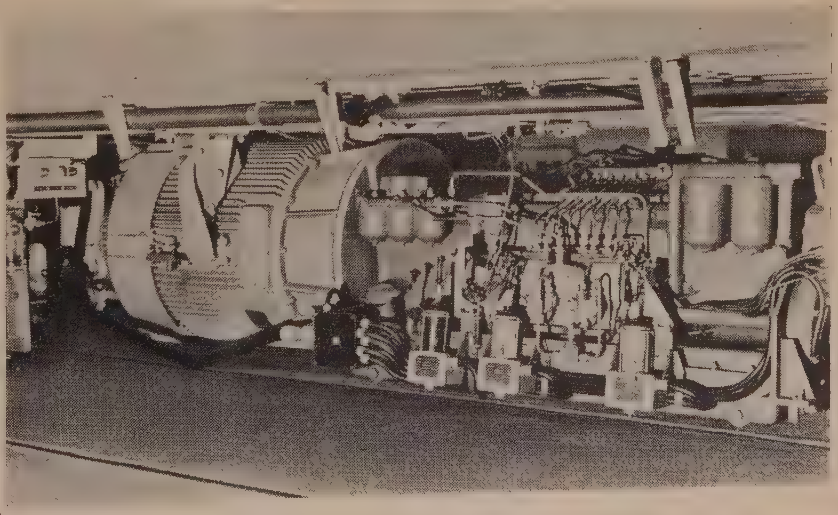
Nuclear Offer to Argentina

A British engineering group has offered to install nuclear power plants in Argentina. According to the *Fortnightly Review* of the Bank of London and South America, a representative of the group said after an interview with President Frondizi that if the offer were accepted a private company would be set up to sell all the electricity produced to the Government. The plant would be situated at sites selected by the Government and agreement would be reached with the Government as to the number of plants to be set up and the price to be charged for the electricity. Credits for up to 70 per cent of the cost of the plant had been arranged. The cost would depend on the size of the installation, but it would not be higher per kW than that of a thermal plant, and within four or five years of operation the difference in total cost between a thermal and a nuclear plant would be saved in fuel.

PULLMAN TRAIN AIR CONDITIONING

A booklet dealing with auxiliary power, air conditioning and other equipment supplied for the new British Railways diesel-electric Pullman trains (see last week's *Electrical Review*, page 1211) has been sent to us by J. Stone & Co. (Deptford), Ltd., Arklow Road, London, S.E.14. The equipment includes 133 kVA 400 V three-phase alternators driven by 190 h.p. Rolls-Royce diesel engines which supply such services as the refrigeration compressor motors, the condenser fan motors, the floor and air heaters and water heating and kitchen loads directly. The air conditioning fan motors are supplied at 24 V d.c. from the transformer-rectifier units which maintain the train batteries in a charged condition. Most of the train lighting is fluorescent and supplied at 230 V from the phase to earth connection of the 400 V feeders while the remainder is supplied at 110 V through a transformer. The booklet also refers in detail to the air conditioning equipment, the inter-coach couplers and speedometers and distance counters and the equipment supplied for each coach is itemised.

Stone auxiliary power alternator and exciter unit mounted on a Pullman coach underframe



NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d *each including postage) are obtainable from the Patent Office,* 25, *Southampton Buildings, London, W.C.*2

1955

10062. Regentone Products, Ltd.—Electric apparatus for determining the response of an electric device. 6th July, 1956. (837480.)

23620. Postmaster General.—Base driven transistor amplifier circuits. 2nd November, 1956. (837415.)

24107. Plessey Co., Ltd.—Keyboard electric switches. 8th August, 1956. (837694.)

24433. Plessey Co., Ltd.—Metal ceramics. 8th August, 1956. (837893.)

27379 and 28337. Parsons & Co., Ltd., C. A.—Dynamo-electric machines. 7th and 25th September, 1956. (837546/7.)

33627. Telegraph Construction & Maintenance Co., Ltd.—Moulding insulation around electric cables. 16th November, 1956. (837549.)

34046. British Insulated Callender's Cables, Ltd.—Machines for lapping strips of material on electric conductors and other articles. 27th November, 1956. (837548.)

1956

3011. Plessey Co., Ltd.—Electrolytic condensers. 18th December, 1956. (837419.)

4601. Benjamin Electric, Ltd., and Smith, A. G.—Indirect lighting fittings. 14th May, 1957. (837422.)

9092. Sperry Rand Corporation.—Microwave mixer systems. 23rd March, 1956. (837550.)

9897, 9898 and 9900. Lonza Electric & Chemical Works, Ltd.—Electrolysers for the decomposition of water. 29th March, 1956. (837864/6.)

12347. Philco Corporation.—Frequency convertors. 23rd April, 1956. (837551.)

13718. Eldridge, F. R.—Apparatus for selecting a sequence of signals from a plurality of recorded data signals. 3rd May, 1956. (837552.)

14965. General Electric Co., Ltd.—Particle separators. 22nd July, 1957. (Cognate application 22636, 20th July, 1956.) (837801.)

18776. Zanker, P.—Safety locking devices in centrifugal machines, more particularly electrically driven centrifugal laundry-drying machines. 18th June, 1956. (837600.)

19808. Transformatorenwerk K. Liebknecht Veb.—High tension transformers. 26th June, 1956. (837805.)

20688, 20689 and 20690. Mason Electric Corporation. Snap-action electric switch. 4th July, 1956. (837432/4.)

24132. Stewart, R. B.—Sealing and clamping glands for electric cable junction boxes. 4th October, 1957. (837557.)

24596. New Consolidated Gold Fields, Ltd., and Symes, H. E. J.—Electrically driven wheeled vehicles. 10th August, 1956. (Addition to 722293.) (837439.)

26733. Standard Telephones & Cables, Ltd.—Electric motor control system. 31st August, 1956. (837914.)

28214. General Electric Co., Ltd.—Refractor members for use in lighting fittings for street lighting and like purposes. 4th December, 1957. (837607.)

28753. Etablissements Merlin & Gerin.—Arc-extinction chambers in circuit-breakers. 20th September, 1956. (837441.)

29394. Minneapolis-Honeywell Regulator Co.—Control devices. 26th September, 1956. (837675.)

29496. Belling & Lee, Ltd.—Manufacture of electrical elements. 20th September, 1957. (837442.)

29606. General Electric Co., Ltd.—Nuclear reactors. 26th September, 1957. (837608.)

30133. Plessey Co., Ltd., and United Kingdom Atomic Energy Authority.—Rotary selector valves. 30th September, 1957. (837443.)

31898. Minneapolis-Honeywell Regulator Co.—Safety control system including an electromagnetic control device operated by a time delay circuit. 19th October, 1956. (837445.)

35585. Telegraph Construction & Maintenance Co., Ltd.—Apparatus for measuring the tension in cables. 18th November, 1957. (837615.)

35876. Zahnradfabrik Friedrichshafen A.G.—Electromagnetic friction coupling. 23rd November, 1956. (837884.)

37339. Junghans A.G., Geb.—Clock having mechanical driving means and an electromagnetically actuated winding device. 6th December, 1956. (837682.)

37357. General Electric Co.—Automatic machine tool control. 6th December, 1956. (837817.)

37953. Benjamin Electric, Ltd., and Smith, A. G.—Lighting fittings for electric discharge lamps. 3rd February, 1958. (837819.)

1957

395. Concentric Manufacturing Co., Ltd., and Young, H. E.—Electrically controlled valves. 17th March, 1958. (837899.)

466. A.E.I.-John Thompson Nuclear Energy Co., Ltd.—Fluid-operated servo apparatus. 1st January, 1958. (838509.)

1329. Marconi's Wireless Telegraph Co., Ltd.—Analogue computer devices. 2nd December, 1957. (838104.)

2257. United States Atomic Energy Commission.—Nuclear reactor. 22nd January, 1957. (837769.)

4706. Central Electricity Generating Board, Cummings, W. G., and Redfearn, M. W.—Apparatus for measuring the electrical conductance of a liquid. 12th February, 1958. (837476.) 4730. Apparatus for measuring the concentration of a component of a gaseous mixture. 12th February, 1958. (837477.) 4754. Apparatus for determining the sulphur dioxide concentration in air. 12th February, 1958. (837478.) 4820. Apparatus for recording two or more different variables. 11th March, 1958. (837479.)

5566. Joy Manufacturing Co.—Electrical generating systems. 19th February, 1957. (837770.)

7942. British Thomson-Houston Co., Ltd. —Electrical switches of the vacuum type. 6th February, 1958. (837918.)

8813. Mullard, Ltd.—Cold-cathode trigger tubes. 18th March, 1957. (837904.)

9470. King, Ltd., G. W.—Electrical switch units. 18th March, 1958. (837628.)

11594. Siemens & Halske A.G.—Methods and apparatus for testing electric discharge valves. 9th April, 1957. (837630.)

11731. Automatic Telephone & Electric Co., Ltd.—Party-lines in automatic telephone systems. 24th April, 1958. (837631.)

11877/8. Hamilton Watch Co.—Electric wrist watch. 11th April, 1957. (837842/3.)

11955. Imperial Chemical Industries, Ltd., Berry, R. L. P., Busby, A. D., and Badger, D. V.—Electric arc furnaces. 3rd April, 1958. (837632.)

12034. Western Electric Co., Inc.—Travelling wave tubes. 12th April, 1957. (837564.)

12428. Busch-Jaeger Dürener Metallwerke A.G.—Automatic electric cutout. 16th April, 1957. (Addition to 789326.) (837906.)

14041. General Electric Co., Ltd.—Metal street lighting columns. 2nd May, 1958. (837453.)

14474. Soc. Gram-Electric.—Marine electric motor. 7th May, 1957. (837810.)

17227. Falk, Stadelmann & Co., Ltd.—Conduit boxes for electrical accessories. 25th August, 1958. (837811.)

18537. Pye, Ltd.—Electric attenuators. 12th June, 1958. (837633.)

18986. Esso Research & Engineering Co. —Homogeneous nuclear reactors. 17th June, 1957. (837848.)

19138. Canning & Co., Ltd., W.—Electroplating apparatus. 17th June, 1958. (837495.)

21511/2. Etablissements Merlin & Gerin. —Air-blast circuit-breakers. 8th July, 1957. (837824/5.)

22908. General Motors Corporation.—Dynamo-electric machines. 19th July, 1957. (837779.)

23373. United Kingdom Atomic Energy Authority.—Nuclear reactor fuel elements. 23rd October, 1958. (837853.)

23644. Smit & Co.'s Transformatorenfabriek N.V., W.—Cable making machines. 25th July, 1957. (837499.)

25436. Binder, W. (trading as Binder Komm. Ges. Maschinen- und Elektro-Apparate-Fabrik, W.). — Electromagnetic clutch. 12th August, 1957. (837638.)

25444. Smith, V. K.—Machine for insulating dynamo-electric machine components. 12th August, 1957. (837782.)

26568. De Vries, H.—Piezo-electric pick-ups. 22nd August, 1957. (837952.)

27961. Babcock & Wilcox, Ltd.—Nuclear reactors. 4th September, 1958. (837785.)

28279. Babcock & Wilcox, Ltd.—Power plant. 4th September, 1958. (837786.)

28909. Metropolitan-Vickers Electrical Co., Ltd.—Apparatus for generating high voltage impulses. 10th September, 1958. (837958.)

29977. Sulzer Frères S.A.—No-load circuits for rotary pumps. 24th September, 1957 (837503.)

30743. Fleming, B.—Microwave measuring apparatus. 1st January, 1959. (837733.)

31733. Siemens Edison Swan, Ltd.—Manufacture of multiple contact devices. 24th September, 1958. (837962.)

31981. Revo Electric Co., Ltd.—Electric street lighting fittings. 8th October, 1958. (837736.)

32016. Mason Electric Corporation.—Snap-action electric switch. 14th October, 1957. (837964.)

32062. Schreyer, E. P.—Electric steam irons. 14th October, 1957. (837570.)

32630. Permutit Co., Ltd.—Electrodialytic cells. 17th October, 1958. (837460.)

34160. General Electric Co.—Integrated hydraulic power actuator. 1st November, 1957. (837858.)

37270. General Electric Co.—Gas turbine rotor. 29th November, 1957. (837575.)

37423. Libbey-Owens-Ford Glass Co.—Method of producing electrically conducting bent glass units. 2nd December, 1957. (837968.)

37541. General Electric Co., Ltd., and Gill, R. I.—Waveguides and methods of bending waveguides. 27th November, 1958. (837462.)

37879. Marconi's Wireless Telegraph Co., Ltd.—Subaqueous echo sounders. 17th July, 1958. (Addition to 811440.) (837463.)

37970. Bosch G.m.b.H., R.—Electric accumulators and their manufacture. 6th December, 1957. (837969.)

38244. Teszner, S.—High power field effect transistor. 9th December, 1957. (837651.)

38304. Union Special Maschinenfabrik G.m.b.H.—Electrically driven portable machines for sewing up bags and sacks. 10th

[*Continued on page* 43

'CH' FUSED SWITCHES

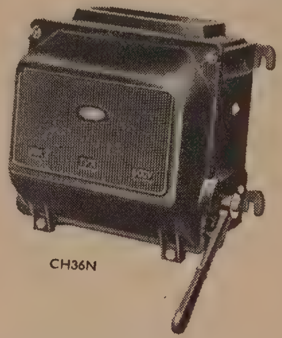
DENNIS

TYPE 'H'

STANDARD PATTERNS

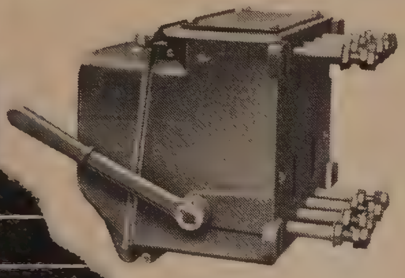
FRONT CONNECTED PATTERN SWITCHES

The normal standard type is known as the front connected pattern and is for use as a loose unit or for mounting above or below ducts or busbar Chambers. The catalogue prefix is "CH" or "CS" according to whether the switch is fused or not.



CH36N

BACK CONNECTED PATTERN SWITCHES



CH320N/B

This pattern is the standard switch provided with insulated screwed stems protruding through the back of the switch complete with locknuts. This type is for mounting on the front of cubicles so that connections of either cable or solid copper can be made to the back of the switch inside the cubicle. The catalogue prefix is CH—/B or CS—/B.

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switchboards incorporating
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protruding
d by a cast
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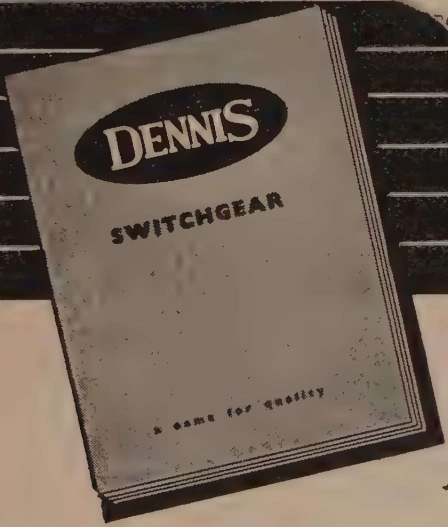

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CVS-29

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1	,,	1" Carbon Steel Holsaw
1	,,	$1\frac{1}{2}$" Carbon Steel Holsaw
3	,,	$\frac{3}{4}$" Carbon Steel Holsaw Blades
3	,,	1" Carbon Steel Holsaw Blades
3	,,	$1\frac{1}{2}$" Carbon Steel Holsaw Blades
2	,,	$\frac{1}{4}$" Pilot Drills
1	,,	CT8 Carbide Drill
1	,,	CT10 ,, ,,
1	,,	CT12 ,, ,,
1	,,	CT14 ,, ,,
1	,,	A14 $\frac{1}{4}$" Wood Auger
1	,,	A38 $\frac{3}{8}$" Wood Auger
1	,,	A12 $\frac{1}{2}$" Wood Auger
1	,,	A58 $\frac{5}{8}$" Wood Auger
1	,,	A34 $\frac{3}{4}$" Wood Auger
1	,,	Set of 4 High Speed Twist Drills ($\frac{1}{16}$", $\frac{1}{8}$", $\frac{3}{16}$", $\frac{1}{4}$")
1	,,	20 ft Extension Lead with Connector

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DR 4 GP — Pistol-grip
DR 5 GP — Side Handle grip
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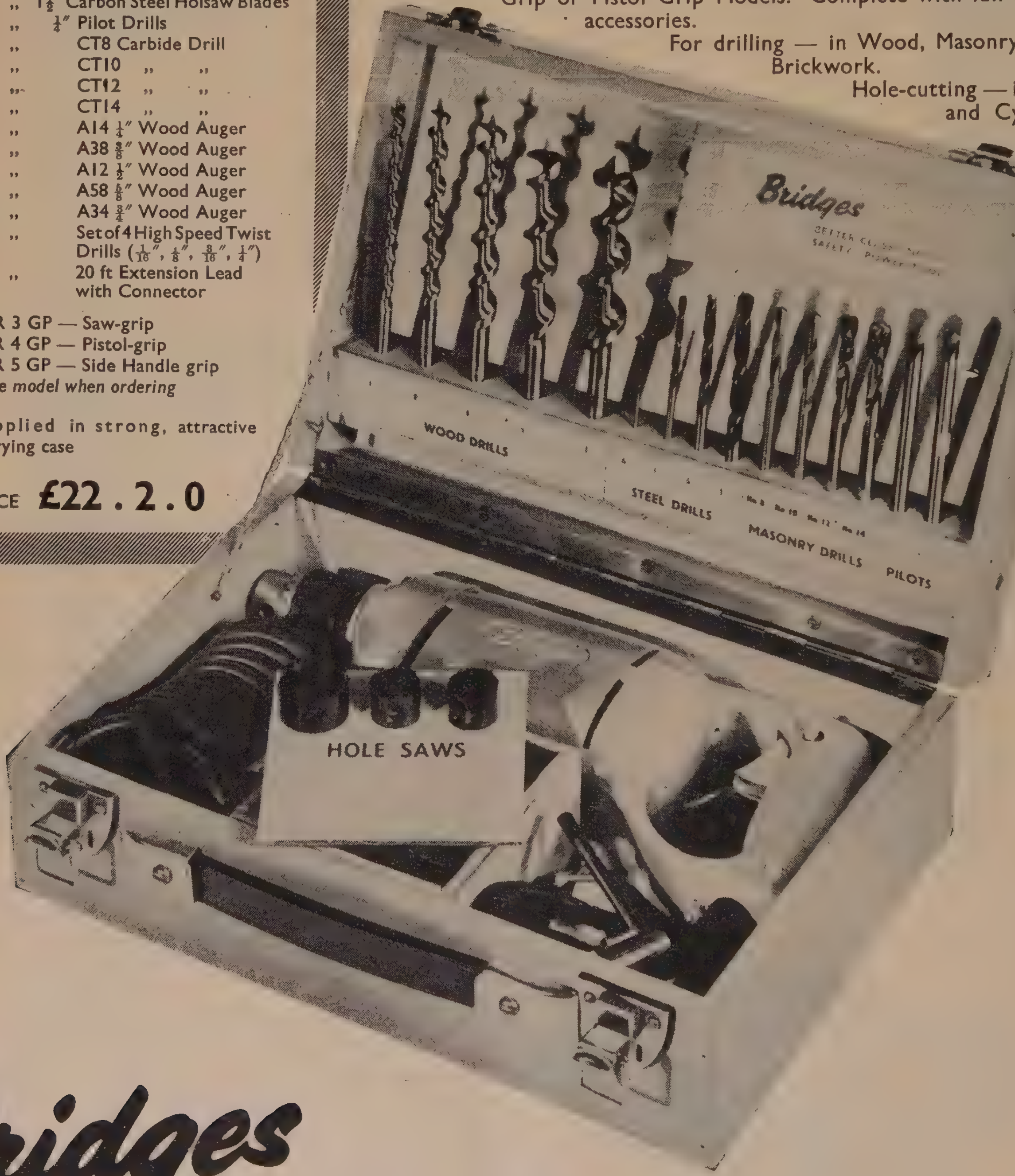

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NEW PATENTS *(continued)*

December, 1957. (Addition to 816812.) (837652.)

38726. Automatic Telephone & Electric Co., Ltd.—Party-line arrangements for automatic telephone switching systems. 10th November, 1958 (837653.)

1958

1329. Thorn Electrical Industries, Ltd.—Luminescent materials. 13th January, 1959. (837351.)

1555. Pirelli-General Cable Works, Ltd.—Jointing electric cables. 5th September, 1958. (837352.)

1562. K.G.M. Electronics, Ltd.—Tape recording mechanisms. 12th January, 1959. (837353.)

2366. Decca Record Co., Ltd.—Radar apparatus. 22nd January, 1959. (837791.)

3162. Parsons & Marine Engineering Turbine Research & Development Association.—Boiler feed regulators. 7th July, 1958. (837872.)

3251. General Electric Co.—Cooling means for a multi-stage turbine. 31st January, 1958. (836952.)

5549. Robotron Corporation.—Control circuits for welding systems. 20th February, 1958. (837794.)

6011. Arrow Electric Switches, Ltd.—Electromagnetic contactors. 25th February, 1958. (836573.)

7410. Bofors A.B.—Switching devices for a.c. voltages. 7th March, 1958. (837173.)

8778. Westinghouse Electric Corporation.—Electric heater assemblies. 19th March, 1958. (837174.)

9106. Westinghouse Electric Corporation.—Magnetic amplifiers. 21st March, 1958. (837176.)

10128. Görike, R.—Small-size condenser microphone. 28th March, 1958. (836959.)

11943. Philips Electrical Industries, Ltd.—Methods of manufacturing helically wound filaments. 15th April, 1958. (837181.)

12080. Patelhold Patentverwertungs- & Elektro-Holding A.G.—High frequency furnaces. 16th April, 1958. (837063.)

12541. Westinghouse Electric Corporation.—Pulse generator circuits. 21st April, 1958. (837509.)

13485. Siemens & Halske A.G.—Electronic decoding apparatus for decoding code numbers having various numbers of digits in telecommunications systems. 28th April, 1958. (837931.)

14390. Schiffman, A.—Instruments for testing electrical conductors carrying a.c. 6th May, 1958. (836679.)

17683. Slepian, J.—Separation of isotopes in electric and magnetic fields. 3rd June, 1958. (837186.)

18584. Loewy Engineering Co., Ltd.—Thermal safety switch device for electrical apparatus. 10th June, 1958. (Addition to 800247.) (836685.)

20494. Standard Telephones & Cables, Ltd.—Push-button electric selector switches. 26th June, 1958. (837934.)

20539. Philips Electrical Industries, Ltd. (Philips Gloeilampenfabrieken N.V.).—Telephone exchange circuit arrangements. 26th June, 1958. (837257.)

21102. Siemens & Halske A.G.—Circuit arrangements for telephone systems having means for storing metering pulses. 1st July, 1958. (837259.)

22578. Lange, E.—Fluid-blast electric switches. 15th July, 1958. (836750.)

22672. Sulzer Freres S.A.—Furnaces of supercritical once-through boilers. 15th July, 1958. (837261.)

24218. Saxonburg Ceramics.—End seal for electrical heating elements. 28th July, 1958. (836688.)

24837. General Motors Corporation.—Dynamo-electric machines. 1st August, 1958. (837937.)

24927. Hughes Aircraft Co.—Miniature electric switching devices. 1st August, 1958. (837938.)

25163. Borandi, A.—Christmas tree ornamenting and lighting arrangements. 6th August, 1958. (837726.)

26286. General Electric Co.—Non-rectifying contacts to silicon carbide. 15th August, 1958. (837265.)

26294. Standard Telephones & Cables, Ltd.—Catswhiskers for point-contact semiconductor devices. 15th August, 1958. (836754.)

26480. Hubbell, Inc., H.—Electrical dead-front socket outlet and a plug cap for use in combination therewith. 18th August, 1958. (837189.)

27808. Telefonaktiebolaget L. M. Ericsson.—Multiplex pulse transmission systems for use in communications installations. 29th August, 1958. (836756.)

31506. Siemens-Schuckertwerke A.G.—Manufacture of nuclear fuel elements. 2nd October, 1958. (837878.)

31806. Eitel-McCullough, Inc.—Electron tube. 6th October, 1958. (838867.)

32211. Standard Telephones & Cables, Ltd.—Electrical equipment practice. 9th October, 1958. (837380.)

32327/8. Varian Associates.—Electron tube apparatus. 3rd August, 1956. (Divided out of 837292.) (837293/4.)

32698. National Cash Register Co.—Electrical programming device. 14th October, 1958. (837383.)

36307. Kreutzer, O.—Plug-in transistorised current chopper or invertor unit. 12th November, 1958. (836765.)

36587. Bendix Aviation Corporation.—Transistorised monostable multivibrator and amplifier circuit. 13th November, 1958. (836766.)

37399. Leistikow, F. W. R. (Cherniak, G. S.).—Transducing devices. 20th November, 1958. (837395.)

38013. Telefunken G.m.b.H.—Pulse controlled duo-stable circuit arrangements. 6th December, 1957. (832435.)

38487. Kile, H. S.—Electric oil well heater. 11th December, 1957. (832437.)

39098. Sylvania Electric Products, Inc.—Electron tube. 4th December, 1958. (837758.)

39834. Standard Telephones & Cables, Ltd.—Signal compression and expansion arrangements for electric communication circuits. 23rd December, 1957. (832863.)

39883. General Electric Co.—Process for producing silicon-iron alloy sheets. 23rd December, 1957. (832438.)

41154. Standard Telephones & Cables, Ltd.—Information storage device and storage matrix therefor. 19th December, 1958. (837403.)

41157. Nippon Electric Co., Ltd.—Facsimile signal producing equipment. 19th December, 1958. (836767.)

41159/60. Varian Associates.—Velocity modulation electron tubes. 12th June, 1956. (Divided out of 836871.) (836872/3.)

41426/7. Arrow Electric Switches, Ltd.—Electromagnetic switches. 13th May, 1957. (Divided out of 836571.) (836574/5.)

41875. Philips Electrical Industries, Ltd.—Geiger-Müller counters. 29th December, 1958. (836190.)

42024. Western Electric Co., Inc.—Signal transmission systems. 30th December, 1958. (837670.)

1959

54. Soc. d'Electronique et d'Automatisme S.A.—Electrical circuit devices. 1st January, 1959. (836769.)

208. Mullard, Ltd.—Magnetic focusing assembly. 2nd January, 1959. (836770.)

901. Standard Telephones & Cables, Ltd.—Electroluminescent light amplifier or image convertor and method of manufacturing same. 9th January, 1959. (838902.)

1478. Standard Telephones & Cables, Ltd.—Thermionic cathodes. 15th January, 1959. (838284.)

2324. Compagnie Générale de Télégraphie sans Fil.—Short wave primary electromagnetic radiation sources. 21st January, 1959. (838287.)

20633. General Electric Co.—Thermionic cathodes. 25th June, 1956. (Divided out of 831133.) (836109.)

24262. Bosch G.m.b.H., R.—Electrical generator regulating systems, especially for mechanically propelled vehicles. 12th July, 1957. (Divided out of 835210.) (836110.)

26426. Decca Record Co., Ltd.—Cathode-ray tube display apparatus. 25th October, 1957. (Divided out of 837201.) (837203.)

36784 and 36955. British Telecommunications Research, Ltd.—Automatic telephone systems. 11th July, 1956. (Divided out of 836557.) (836558/9.)

Street Lighting Notes

Ashington (Northumberland) U.D.C. has approved a £2,657 lighting scheme for First and Second Avenues and Hawthorn Road.

Bootle Corporation is to seek sanction to borrow £15,300 for completing Stage 3 of the Council's street lighting conversion scheme from gas to sodium electric-discharge lighting.

Colwyn Bay Corporation proposes to proceed with a scheme for the conversion of the street lighting in the central area of the town from gas to electricity at an estimated cost of £31,600.

Consett U.D.C. is to spend £5,300 on improving the street lighting between Consett and Junction Bridge.

Halifax Corporation is to carry out schemes for the improvement of street lighting in various roads. Loan sanction is being sought for £31,490.

Southampton Corporation is applying for sanction to borrow £13,498 for the improvement of the street lighting.

Stockton-on-Tees Town Council is to consider relighting the approach road to the Tees (Newport) Bridge. The cost is estimated at £6,000.

Whitehaven Corporation has approved street lighting schemes estimated to cost £16,570.

A scheme for the conversion of street lighting from gas to electricity at **Wigan** is estimated to cost £25,716.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that dates for their functions do not clash with others already arranged

MONDAY, 4th JULY to THURSDAY, 7th JULY

Harrogate.—Sun Pavilion. British Computer Society. Annual conference.

TUESDAY, 5th JULY to FRIDAY, 8th JULY

Cambridge.—Royal Agricultural Society Show.

WEDNESDAY, 6th JULY

Manchester.—Engineers' Club, Albert Square. 7.15 p.m. A.S.E.E. Manchester Branch. Films evening.

Preston.—R.A.F.A. Club, East View, 7.30 p.m. "Connectors and Crimped Joints" (Hellermann, Ltd.).

Wood Green.—Civic Centre, Town Hall, 8 p.m. A.S.E.E. North London Branch. "The Work of the N.I.C.E.I.C." by H. C. Breeze.

THURSDAY, 7th JULY

London.—At the offices of the Electricity Council, Winsley Street, W.1, 11 a.m. Electrical Industries Benevolent Association. Annual general meeting, followed by Council and Court meetings.

THURSDAY, 7th JULY to WEDNESDAY, 13th JULY

Manchester.—College of Science and Technology. Institution of Electronics (Northern Division). Annual Electronics and Instruments Exhibition and Convention.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Electricity Commission of New South Wales, Sydney. 1st August. 415 V distribution boards. (E.S.B. 15915/60.)*

Berkshire.—County Council. Lighting of Botley and Woodstock roundabouts, Oxford By-pass. (See this issue.)

Hereford.—City Council. 11th July. Electrical installations in 105 houses, Redhill estate, Section 4; 102 houses and 10 bungalows, Redhill estate, Section 5; and 62 houses, Newton Farm estate, Section 4. (See this issue.)

Morley. — Town Council. 18th July. Sodium street lighting installation. (See this issue.)

New Zealand.—Director General (Stores Division), General Post Office, Wellington. 5th August. Alligator clips, detectors and cases, and instrument leads. (E.S.B. 16586/60.)* 8th August. Resistance banks. (E.S.B. 16587/60.)*

Auckland Electric Power Board. 22nd July. Cable. (E.S.B. 16596-7/60.)*

Nigeria. — Electricity Corporation of Nigeria. 30th July. Two 1,000 kW diesel alternator sets. (See this issue.)

Skelton and Brotton (Yorks.).—U.D.C. Electric wiring of 42 houses at Marske Lane, Saltburn. Surveyor, Council Offices, Skelton-in-Cleveland.

South Africa.—Union Tender Board, Pretoria. 22nd July. Winding wire for motors. (E.S.B. 16554/60.)*

Transvaal Provincial Tender Board, Pretoria. 15th July. Electrically driven welding generators. (E.S.B. 16634/60.)*

Southampton.—Corporation. 15th August. Electrical installation in new central swimming baths. (See this issue.)

Sunderland.—Corporation. Electrical installations in Plains Farm Junior and Infants' School (for water heating purposes), Bede Grammar Schools (kitchen and dining room block), and 138 houses. Borough architect, Grange House, Stockton Road.

Twickenham. — Borough Council. 22nd July. Approximately 600 sodium and fluorescent lighting units for Stage 4 of the street lighting improvement scheme. (See this issue.)

ORDERS PLACED

Carlisle.—Corporation. Erection of 29 Class "A" and 57 Class "B" lighting columns on the Morton housing estate, Carlisle (£2,892).—B. L. Oliver. Lift installation at new Civic Centre (£30,855).—Express Lift Co.

Dover.—Works Committee. Rewiring of engine room at the waterworks.—E. R. Longley.

Glasgow.—Housing Committee. 1,500 electric cookers (£30,375).—Simplex Electric Co.

London.—L.C.C. Supply and installation of 494 electric water heaters, Watling estate, Edgware (£27,617).—F. J. Baynes & Co.

St. Pancras Borough Council. Street lighting improvements (£48,438).—G.E.C.

Stockton-on-Tees.—Corporation. Electrical work at Roseworth Secondary Modern School (£1,105).—Rose & Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Abercarn.—Houses (152), Trinant, Aberbeeg; U.D.C. surveyor, Council Offices, Abercarn, Mon.

Beaminster. — Grammar-modern school; county architect, County Hall, Dorchester.

Beverley.—Administrative block, Cattle Market; Anthony Steel & Owen, architects, 199, Anlaby Road, Hull.

Cardiff.—Showrooms and offices, Queen Street; James Crosby & Sons, Ltd., 59, Queens Gardens, London, W.2.

Chelmsford.—Dwellings (117), Beech's estate; Cooper Estates, Ltd., Wilmington House, Dartford.

Works extensions; Eytor Lens Manufacturers, Ltd., Legg Street.

Crook (Co. Durham).—Houses (100), Sunnybrow and Crook; Page, Son & Hill, architects, 75, King Street, South Shields.

Refractories manufacturing plant for West Hunwick Silica & Firebrick Co. (£250,000); British Ceramic Services, Ltd., contractors, Newcastle (Staffordshire).

Eastbourne.—Hostel for aged persons; borough engineer.

East Retford.—Houses (48), West Hill estate; Myles-White & Associates, Council's architects, White Hart Chambers, Mansfield.

Edinburgh.—Arts faculty buildings, George Square, for University; Gibson & Simpson, quantity surveyors, 3, Melville Crescent.

Felling (Co. Durham).—Shops, offices and showrooms, High Street; Pomeroy Developments, Ltd., Wigmore Street, London, W.1.

Feltham. — Showrooms and offices; Murphy's of Feltham, Ltd., 11, High Street.

Fort William.—New hospital; J. Gleave, architect, 21, Woodside Place, Glasgow.

Greenford.—Showrooms and offices, Ruislip Road estate; John Bickerdike, architect, 88, George Street, London, W.1.

Grimsby.—Extensions to transport depot, Victoria Street; borough engineer, Municipal Offices, Town Hall Square.

Halesowen.—Flats (250), Highfields estate; borough surveyor.

Hamilton.—Houses (122), Udstonhillhouse; burgh architect, 56, Brandon Street.

Harleston.—Factory and offices; Rotary Hoes, Ltd., Station Road, West Horndon, Essex.

Harlow.—Lutheran church (£20,000); Fowler & Sutton, architects, Parliament Mansions, Abbey Orchard Street, London, S.W.1.

Hereford.—Showrooms and offices, Widemarsh Street; Geo. H. Davies & Hurley, architects, College Street, Ammanford.

Hoddesdon.—R.C. church, Esdaile Lane; J. H. Alleyn, architect, Berners Street, London, W.1.

Johnstone.—Houses (66); Scottish Special Housing Association, Ltd., 15, Palmerston Place, Edinburgh, 12.

Kilburn.—Day nursery and clinic, Victoria Place (£55,600); C. G. Stillman, county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Leeds.—New terminal buildings at the Airport; Norman & Dawbarn, architects to City Council, 7, Portland Place, London, W.1.

Leicester.—Factory and offices; Crane & Percival, Ltd., Devonshire Road.

London.—Six blocks of flats, Teesdale estate extension, Bethnal Green; Walter Lawrence & Son, Ltd., 31, Sun Street, E.C.2.

Flats and maisonnettes (118), West Hill, Putney; Sir Lancelot Keay, architect, 22, Oldbury Place, W.1.

Maltby.—Factory extension for D. Byford & Co., Stimpson & Rollston, builders, West Avenue, Wigston.

Mill Hill.—Office block; International Serum Co., Ltd., Frith Lane, N.W.7.

Newcastle-on-Tyne.—Extensions to headquarters in Benfield Road for Newcastle Hospital Board; P. H. Knighton, Board's chief architect.

Houses (57) and maisonnettes (92), Walker Road; city architect, 18, Cloth Market.

Northallerton.—Houses (22) and eight flats, Forest Road estate; Brierley, Leckenby & Keighley, architects, 10, Lendal, York.

North Cotswold.—Houses at Bourton-on-the-Water (26) and Moreton-in-Marsh (13); T. Rayson, Council's architect, 29, Beaumont Street, Oxford.

Nuneaton.—Public library, Church Street (£70,000); borough engineer, Council House.

Ormesby.—Infants' school; Denis Clarke Hall, architect, 6, Mason's Yard, Duke Street, London, S.W.1.

Ottery St. Mary.—Houses (33); Antony R. Lamb, architect, 2, Prospect Place.

Perth.—Out-patients', casualty and X-ray departments for Royal Infirmary; McKillop & McIntosh, architects, 2, Atholl Place.

Port Glasgow.—Works extensions; Wovenair, Ltd., industrial estate.

Prescot.—Dwellings (127), Derby Street; Gornall, Kelly & Partners, architects, 155, The Albany, Liverpool.

Rainford.—Factory; Frank Franklin & Sons, Ltd., Anderton Street, Wigan.

Southampton.—Flats (73), Lansdowne Hill; Hawkins Bros., Ltd., Westfield Road, Gosport.

Stockton-on-Tees.—Houses (35), Hardwick estate; borough architect, 28, The Square.

Surrey.—Welfare centres/school clinics, West Molesey and Wallington, and training centres, Kingston-on-Thames and Purley; county architect, County Hall, Kingston-on-Thames.

Twickenham.—School, Cross Deep; Dodge & Reid, architects, 72, High Street, Brentford.

Wakefield.—Office block for Charles Roberts & Co.; Firth, Son & Blackburn, architects, Broadway House, Dewsbury.

Wednesbury.—Works extensions; Smith & Davis, Ltd., Beacon Works, Friar Park Road.

Welwyn Garden City.—Houses (222) and flats (40); Charles W. Fox, architect, National Provincial Bank Chambers, Stonehills, Welwyn Garden City, Herts.

West Bromwich.—Laboratories, workshops and welfare block; Synthite, Ltd., Riders Green Road.

West Hendon.—Additional factory and offices for Schweppes, Ltd.; Gilbert-Ash, Ltd., 2, Stanhope Gate, W.1.

Winchmore Hill.—Office block, Green Lanes; Rodwell Properties, Ltd., 9, Hertford Street, London, W.1.

Windsor.—County primary school at Old Windsor (£53,728); county architect, Wilton House, Parkside Road, Reading.

Woking.—Four-storey maisonnettes (52), Pares Close estate; H. P. Tame, surveyor, Urban Council Offices.

Worthing.—Houses (64), Limbrick Lane site; borough surveyor, Town Hall.

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* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

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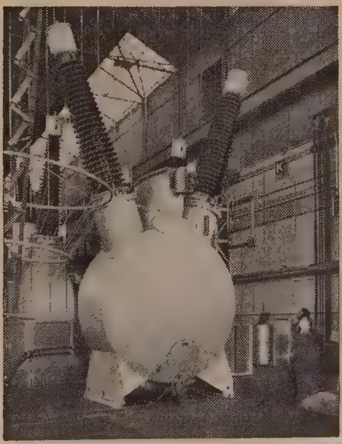

The illustrations show a complete 330 kV. bushing insulator and a 330 kV. circuit breaker, by courtesy of the A.E.I. Co.

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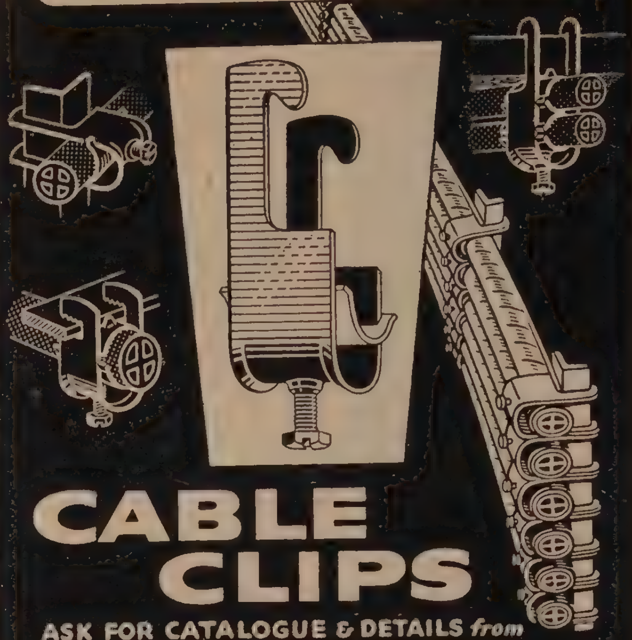

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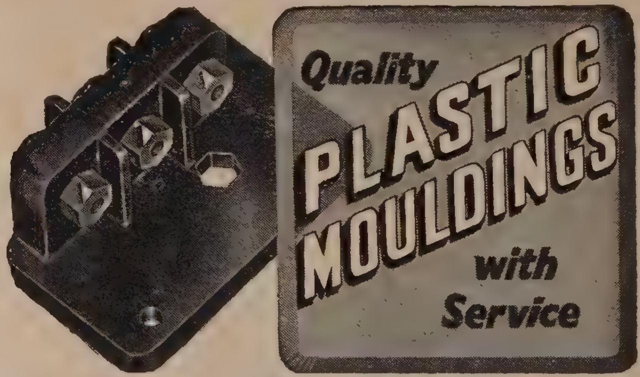

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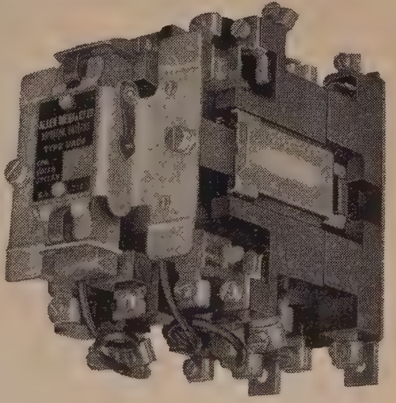

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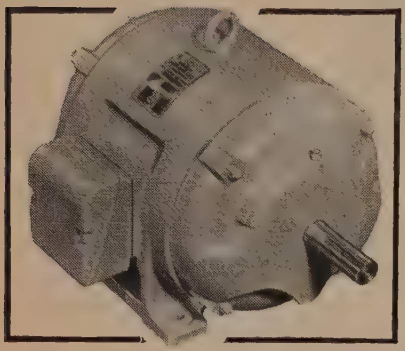

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Patent No. 568702

Catalogue No. P 5806 gives details of all sizes from 60 watt to 500 watt.

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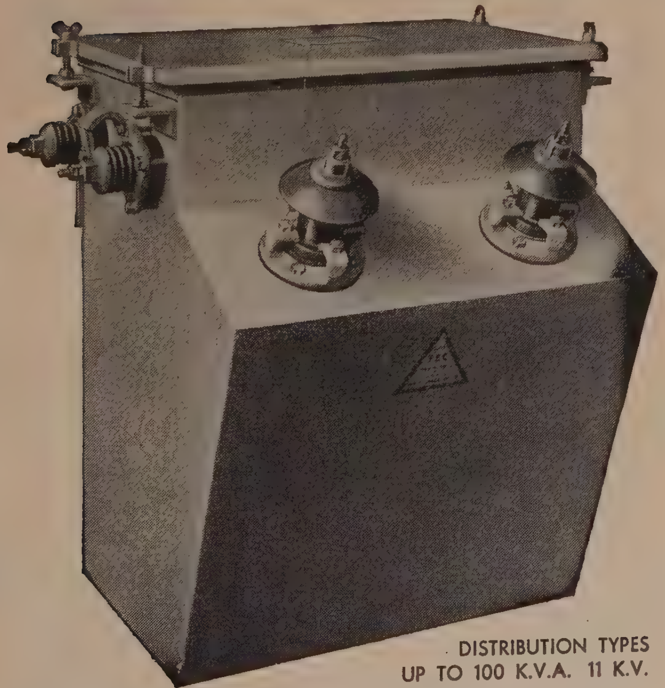
ELECTRONIC CONTROL EQUIPMENT, POWER AND DISTRIBUTION TRANSFORMERS TO 100 kVA, LOW VOLTAGE, FLASH TEST, RECTIFIER AND DENTAL PLATING UNITS, METAL WORK, TRANSFORMER REPAIRS AND CHOKES



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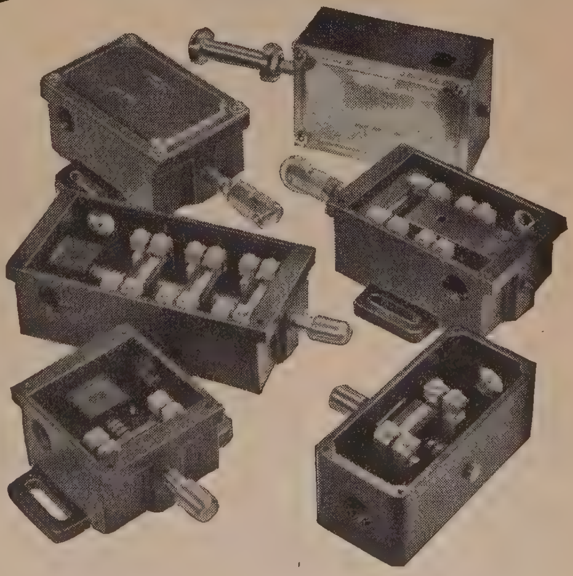

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FLUORESCENT LIGHTING
FITTINGS & CONTROL GEAR

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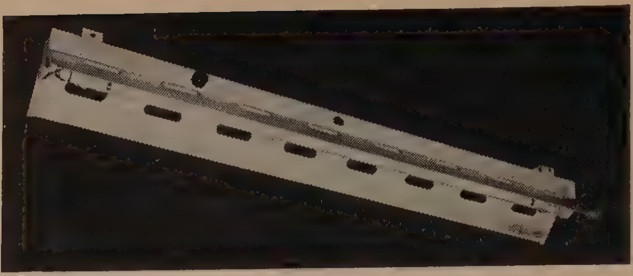
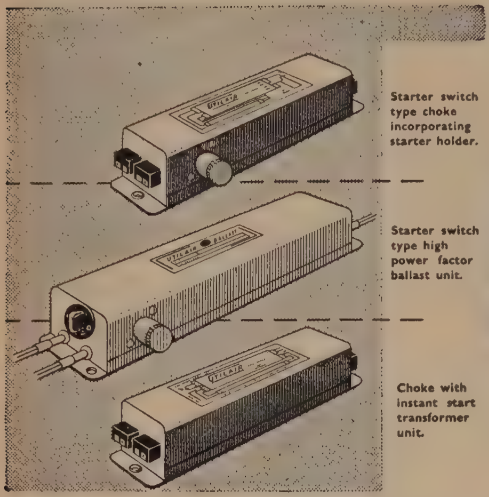


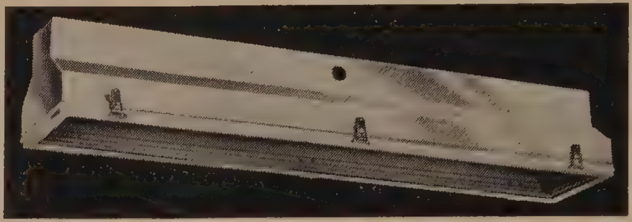
Model SSV.80 Industrial metal trough—slotted top



Starter switch type choke incorporating starter holder.

Starter switch type high power factor ballast unit.

Choke with instant start transformer unit.



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Britain's best range of Fluorescent Fittings selected for efficient lighting by famous concerns all over the world

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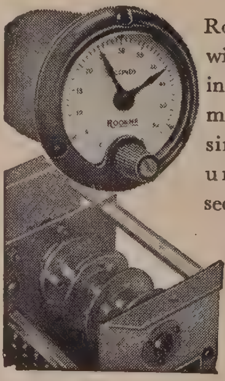
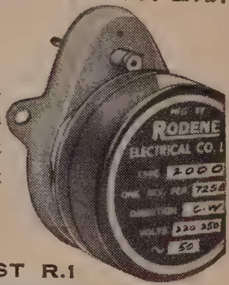


Rodene manufacture a wide range of Timers, including the specialised motors used, from simple single circuit units to complex sequence controllers.

Made in England



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SPACE AND LUXURY 7¼ sq. ft. shelf area, full width vegetable drawer, big frozen food compartment, 2 ice trays, butter and cheese store in the door, spacious door shelves—the L.37 gives space and luxury combined.

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Cooling unit guaranteed 5 years.

CASH PRICE £61.5.9

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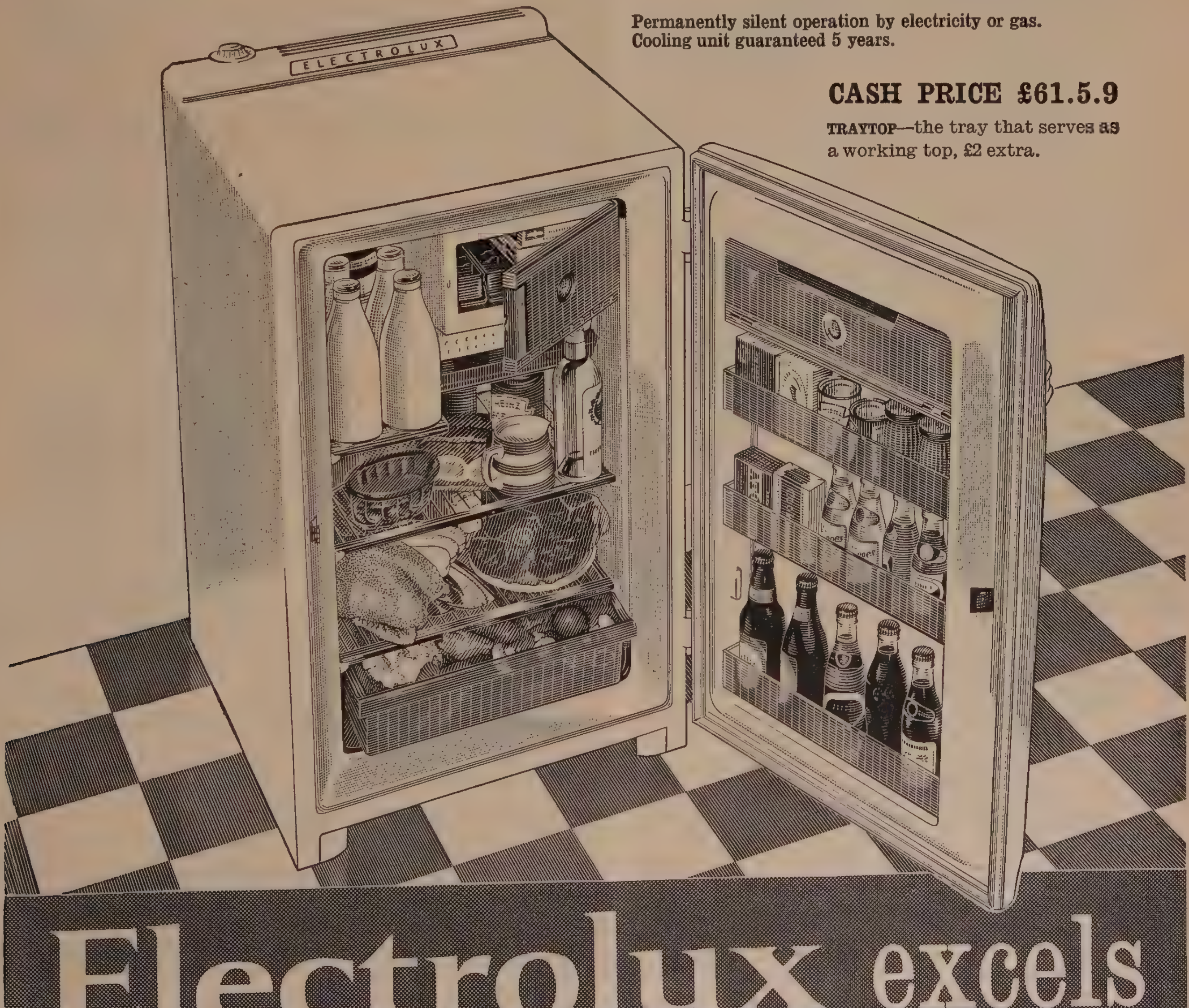

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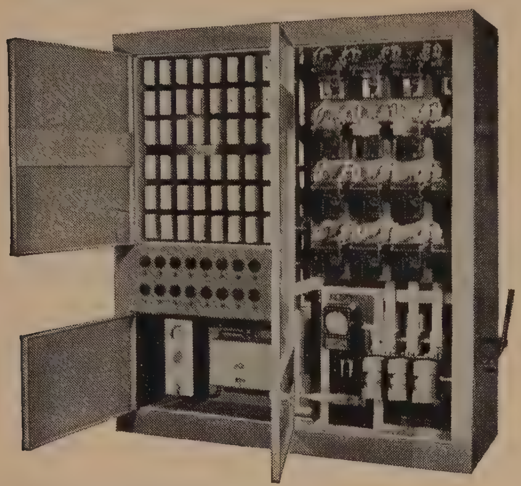
built to individual Specifications



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With the special off-peak tariffs now available through the electricity authorities, the overall cost of thermal storage space heating has been reduced to a most economical figure. We are specialists in the design and manufacture of automatic panels for space heating control and have supplied panels handling up to 500 kW.
The panel illustrated handles 267 kW. and is divided into 16 zones with individual limit thermostats and overall control by time switch ; together with anticipatory control unit. We shall be most happy to quote for your automatic control panel.

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- Comprehensive range of contactors for all types of thermal storage and space heating control — 10 to 350 amp. SINGLE, DOUBLE, TRIPLE AND FOUR POLE.
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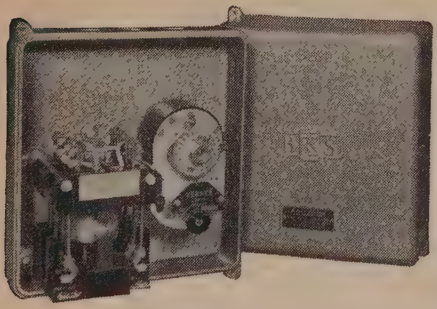

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NO LADDERS REQUIRED

Telescopic appliance for fixing and removing electric bulbs. Any reasonable height can be reached.

Made of Aluminium and can be carried with ease on any cycle.

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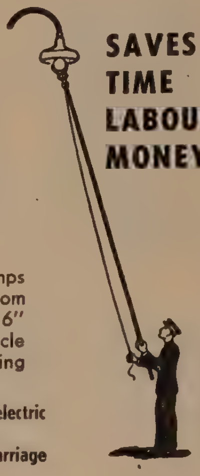

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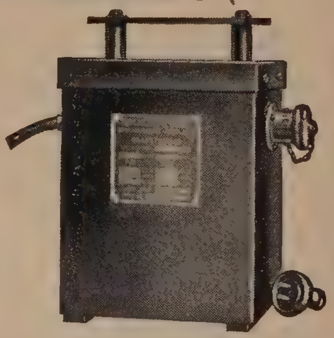

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20 Amp. and 30 Amp.

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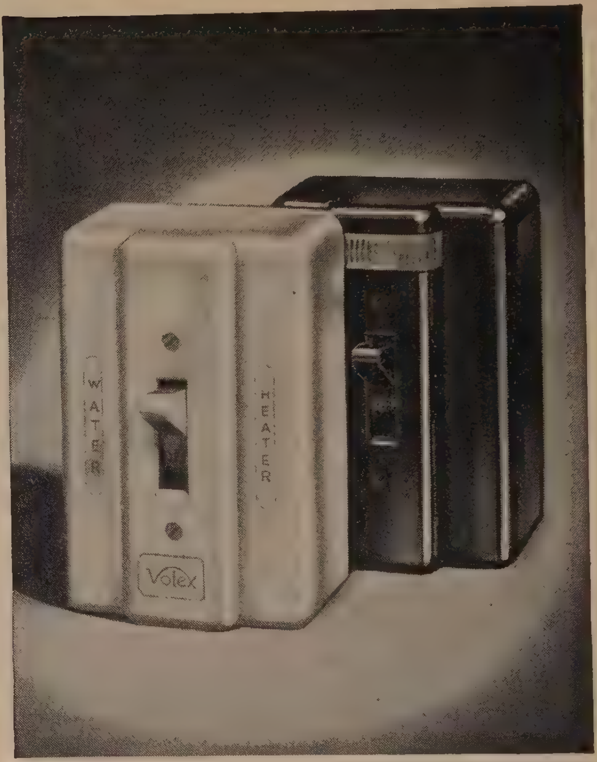

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20 AMP. A.C.

V/5303	Without Pilot light ...		6/8d. each
V/5303CR	„ „	Cream	7/8d. „
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V/5203	Without Pilot light ...		7/8d. each
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V/5204	With Pilot light ...		10/- „
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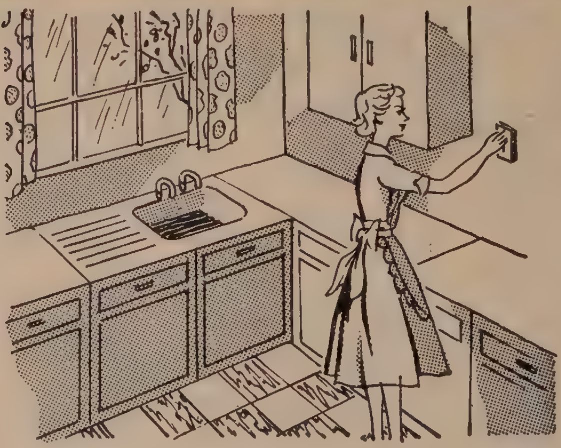

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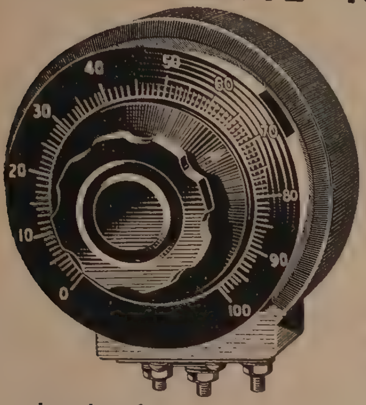

FORMER : Patented ceramic moulding with horizontally opposed copper graphite internal brush movement.

WINDING : Best quality resistance wires to B.S.S. 115.

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Ferrule or wire end type : full range of 24 sizes — 1½ — 250 watts. List VE 190.

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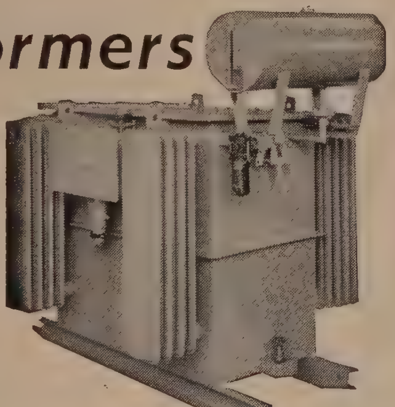
Transformers by Sturdy



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FROM 500 VA
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REGULARLY SUPPLIED TO NATIONAL COAL BOARD, CENTRAL ELECTRICITY GENERATING BOARD, AND MANY OTHER LARGE INDUSTRIAL UNDERTAKINGS

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FOR FINGER-TIP MANUAL OR
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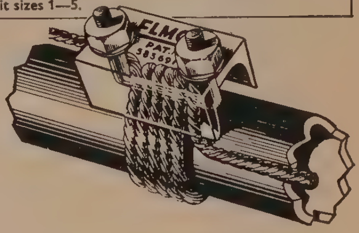
EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948

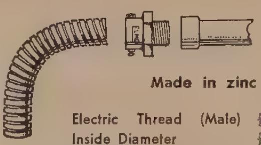
IN 4 SIZES	A123	B45	C67	D8910
for earthing cables up to	7/0.036″	7/0.064″	19/0.064″	19/0.083″
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½″ to ¾″	1″ and 1¼″	1½″ and 2″	2¼″ to 3½″

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029″ and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS



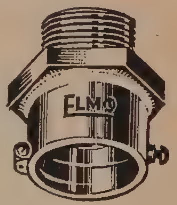
Flexible-to-rigid

CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes:

Electric Thread (Male)	⅝″	¾″	1″	1¼″	1½″	2″
Inside Diameter	⅝″	¾″	1″	1¼″	1½″	2″

Electric Thread (Male)	⅝″	¾″	1″	1¼″
Inside Diameter Flexible Conduit	½″	⅝″	¾″	1″



WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.

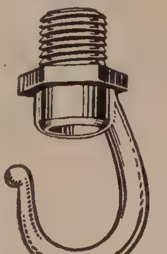
MALE
Hex. Section

CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread					
⅝″	¾″	1″	1¼″	1½″	2″
FEMALE: Electric Thread					
⅝″	¾″	1″	1¼″	1½″	2″

FEMALE
Flat Face Section for Spanner (except ¾″ size, which is round)

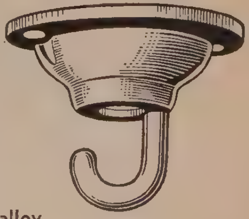


CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ¾″ thread, male electric.

CEILING PLATE

One hook



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Both made in aluminium alloy

Manufactured by M. MOLE & SON LTD.
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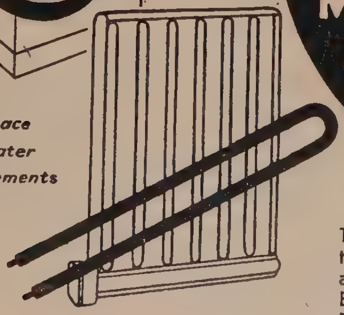

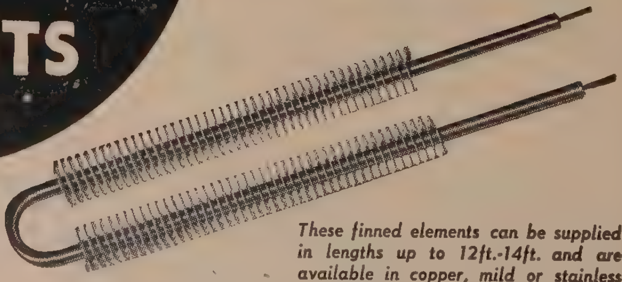

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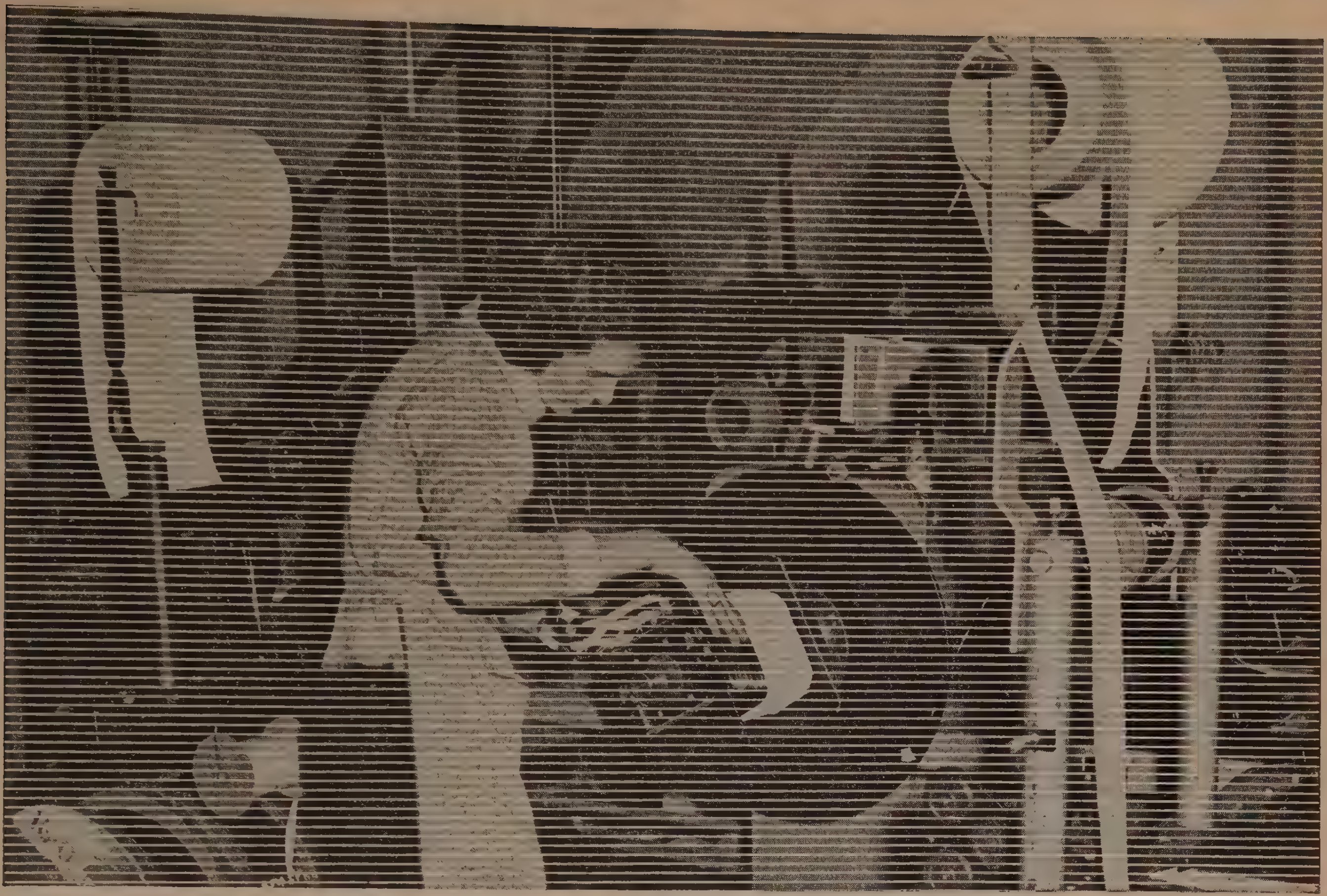
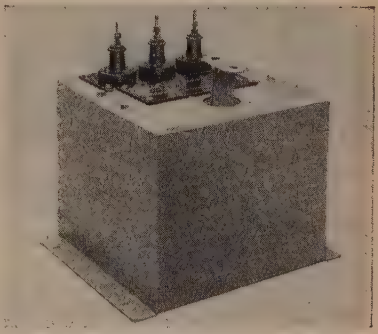


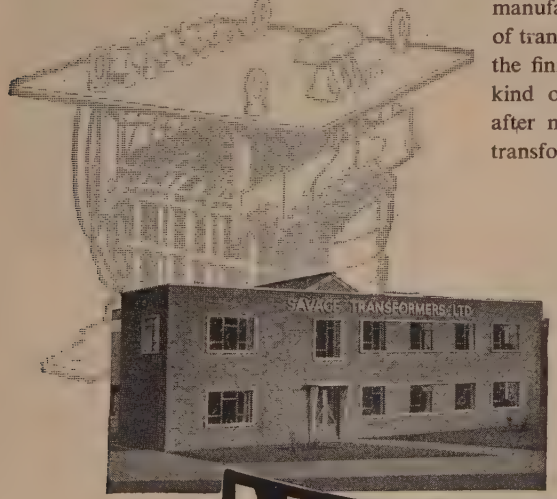
You can buy long life

Not (as yet, anyway) for yourself or any other member of the human race, but certainly for transformers, because long life is just *one* of the qualities built into every Savage Massicore. Many of our transformers whose origins are now shrouded in the mists of time are still doing an honest day's work—a fact made obvious by some of the letters we receive, one of which from T.McD. of Earlsfield reads "A transformer and two chokes of your make purchased about 1932 are still doing yeoman service." The secret of this longevity in Savage transformers is a combination of many things:—the use of only the highest quality materials, painstaking care in manufacture evident in the above illustration of transformer winding, exhaustive testing of the finished instrument and, above all, the kind of technical know-how only gained after many years' experience of designing transformers for special applications.



OUTPUT TRANSFORMER

Primary impedance 12000 ohms. Secondary impedance 0·1 ohms. To handle 2·4 kilowatts at frequencies between 10 K/c and 100 K/c



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THE LITTLE FACTORY
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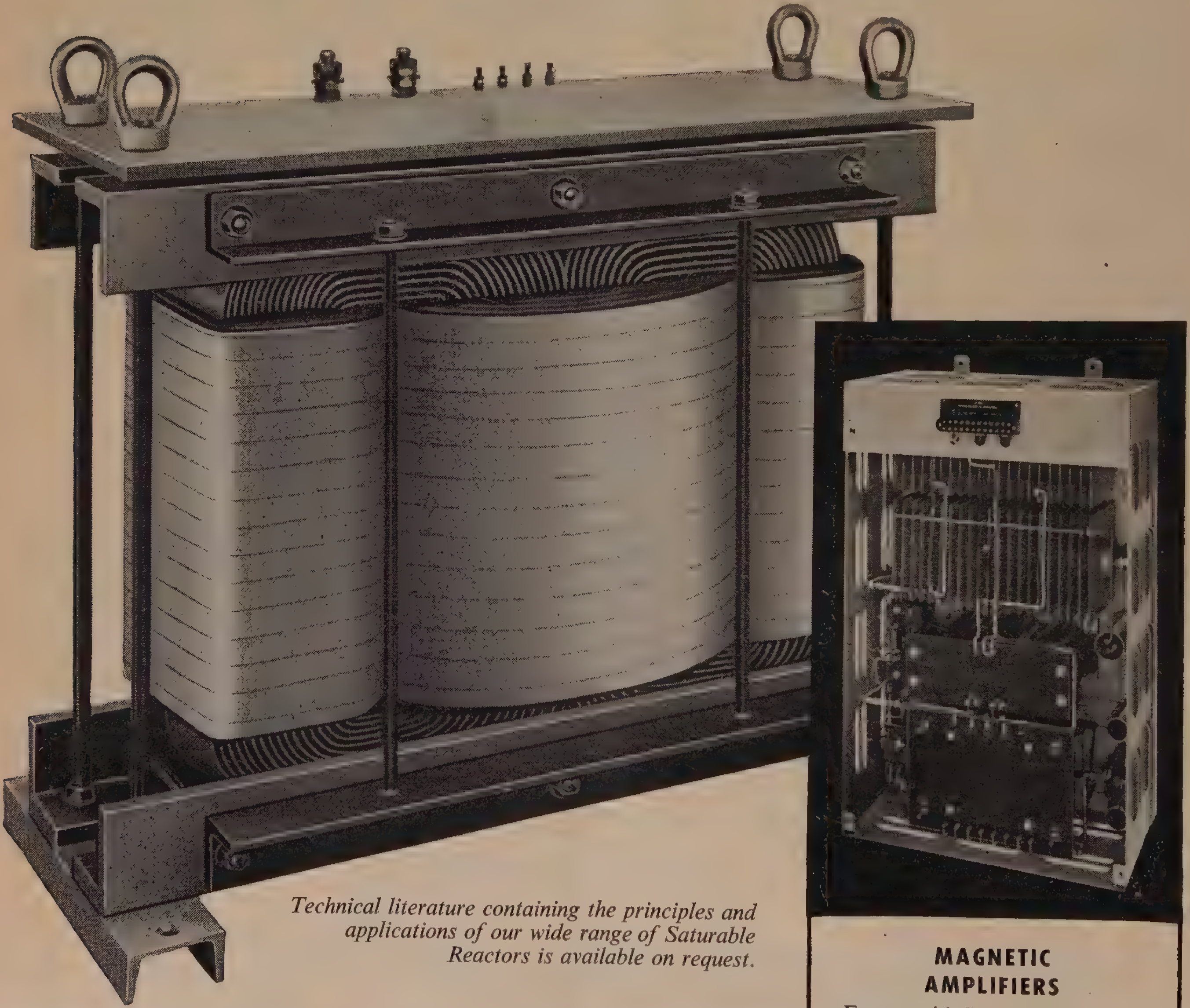

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Operating from 200/250V 50/60 c/s single phase supply, with input of 0-5 mA. DC in 2000/8000 ohms.

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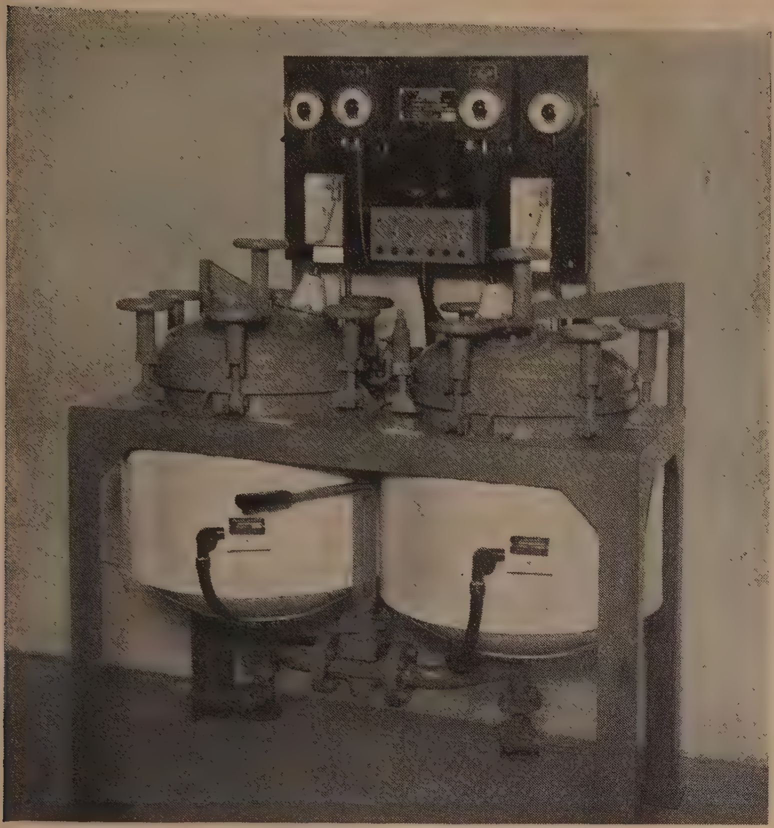

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THE LATEST 13 Amp. 3 WAY ADAPTOR

Combining **ROUND & FLAT PIN** *outlets*

List No. K/135

The first adaptor combining three outlets on one face :-

Two 13 Amp. 3 pin
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Supplied in BROWN *or* WHITE *in attractive* DISPLAY CARTON

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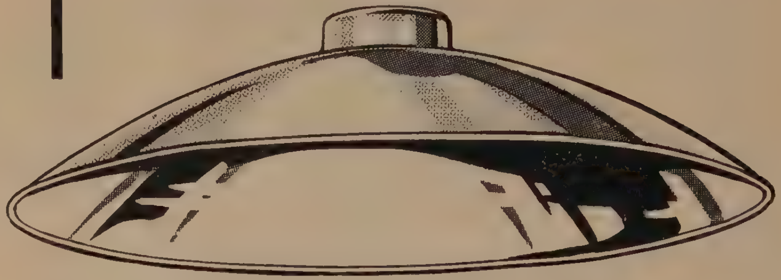

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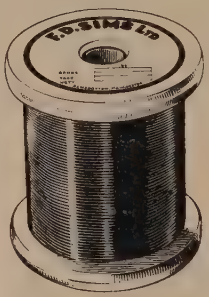
Mercury switches

THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED are the largest specialised manufacturers of Mercury Switches in Great Britain. These are made to exceptionally high and uniform standards of quality.
Since its inception in 1932, this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design manufacture and application.

THE MERCURY SWITCH
MANUFACTURING COMPANY LIMITED
WEST DRAYTON + MIDDLESEX
West Drayton 3157

MS 12

"SIMVAR"
(VINYL ACETAL)



COVERED WIRES

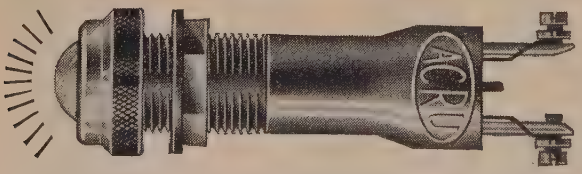
. . . a product of

F.D. SIMS LIMITED

P.O. Box 8 Hazelhurst Works, RAMSBOTTOM, Manchester
Telephone: Ramsbottom 2213/4/5 *Telegrams:* "SIMS" Ramsbottom
London Office and Stores:
106 Newlands Park, Sydenham London S.E. 26 .
Telephone: SYDenham 4211/2

S51

ACRU NEON INDICATOR LAMPS



Used by most Electronic and Electrical Manufacturers throughout the world. Supplied with one-hole fixing. Average life 25,000 hours. There are over twenty-five models. Voltages from 60 to 440.

Ask for details of our new S.E.S. and M.C.C. fittings.

ACRU ELECTRIC TOOL MFG. CO. LTD.
Acru Works, Demmings Road, Councillor Lane, Cheadle, Cheshire. Tel.: Gatley 6058

A.I.D. APPROVED

TRANSFORMERS
of all types up to 25 kVA for Single or Three Phase operation, Phase Conversion, etc.

INDUCTA

COILS
for Contactors, E.M. Brakes, Air Valves, etc. and COIL WINDINGS for all purposes.

MAINS
Output, and Special Purpose Transformers for Radio Equipment, Chokes, etc.

SOLENOIDS
for A.C. and D.C. Operation

W. F. PARSONAGE & Cº LTD
INDUCTA WORKS
PARK RD BLOXWICH WALSALL
TELEPHONE: BLOX. 76464

SAFE

Live contacts shielded, short circuit protection by BS 1361 Cartridge Fuse Links carried in the fuse handle.

SIMPLE

Blown fuses easily replaced, just clip a new fuse in the holder.

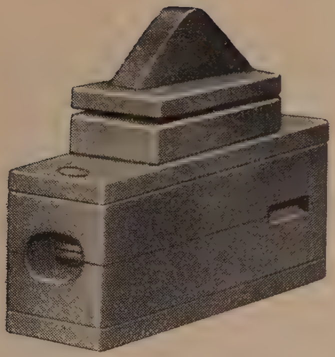
STURDY

Three parts only of moulded insulation of adequate thickness.

Fuse Holders by...

Weekes

A fully insulated Holder and Base, for domestic type cartridge fuse links. BS 1361-1947.

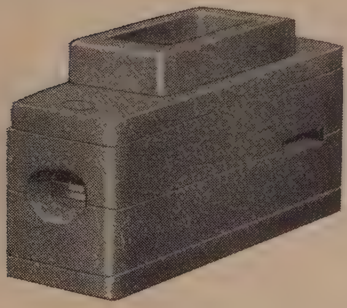


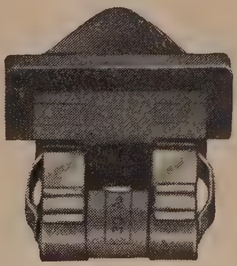
Needed for:-

- CUT OUTS
- SPLITTERS
- DISTRIBUTION FUSE BOARDS
- DOMESTIC SUPPLY CONTROL UNITS
- ETC.

Ratings:-

5, 15, and 30 Amps. 250 Volts. Not interchangeable

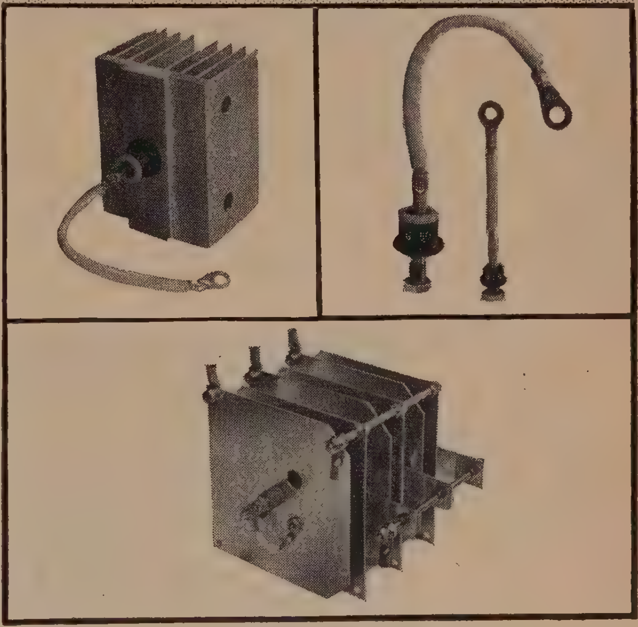




L. WEEKES (LUTON) LTD.
WINGATE ROAD • LUTON • BEDS.
Telephone: Luton 51478 Grams: 'Saftee' Luton

SEMICONDUCTOR

POWER RECTIFIERS



J. STONE & COMPANY (DEPTFORD) LIMITED now offer Semiconductor power rectifier cells of 10 amp. and 50 amp. rating with absolute maximum P.I.V. up to 400 volts.

These cells have an extremely low forward voltage drop making possible rectification efficiencies in excess of 99%. Assembled stacks of 10 amp. cells giving all normal arrangements can be provided.

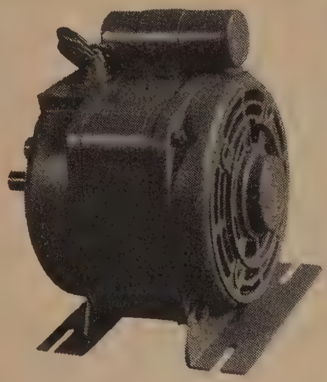
J. STONE & CO. (DEPTFORD) LTD.

ARKLOW ROAD, LONDON, S.E.14

further information on request from

STONE PLATT GROUP

CRAWLEY WORKS GATWICK ROAD CRAWLEY SUSSEX



Always in the forefront of Electrical Progress

NORMACEM -PARVEX of France

now present their new improved motors for household Washing Machines

★ **We have a wide range of fractional H.P. motors, also shaded pole motors for Spin Dryers.**

Fully descriptive literature is available on request

Sole Concessionaires for the United Kingdom

DAVID JACKSON (ENGINEERING) LTD.
11 Mauldeth Road, Withington
Manchester 20
Telephone: Rusholme 6124, 6802

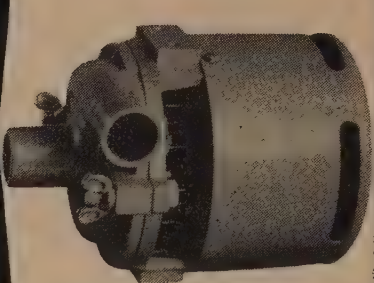
The NORMACEM-PARVEX

2 Speed Single phase Motor

TYPE C.9.

This motor has been designed exclusively to eliminate the necessity of gear boxes and other complicated methods of transmission in fully automatic tumbler-action Washing Machines.

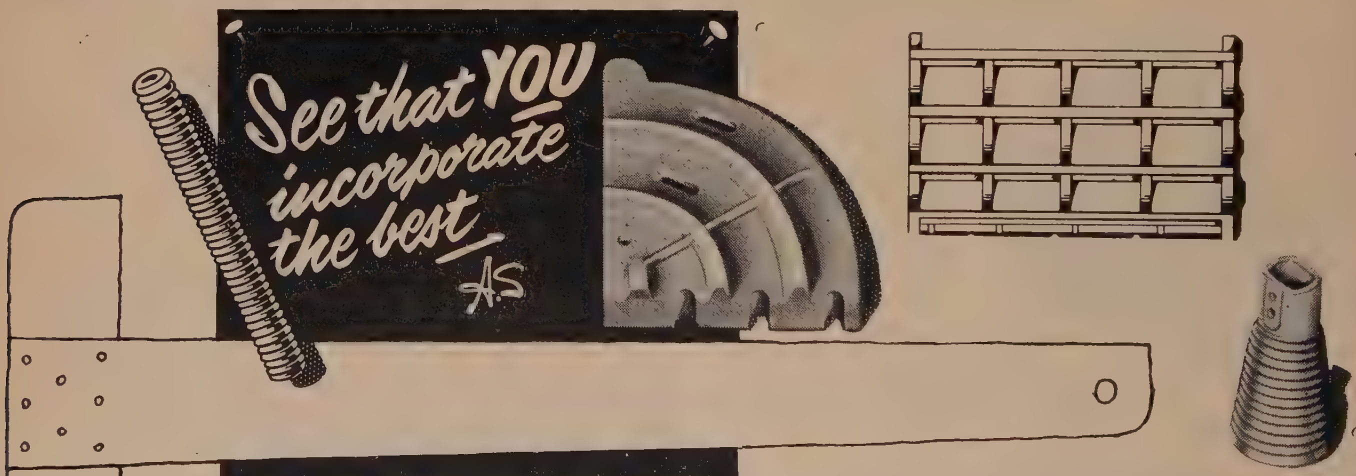
There are many innovations with this design, among them is the V-Belt drive which enables the drum to be driven in either direction. The lamination stack is 45 mm. It has a squirrel-cage rotor and the casing is die-cast aluminium.



The NORMACEM-PARVEX

Motor Pump Unit

One of the main advantages of this unit is the special turbine designed to eliminate any blockage by small particles of laundry, buttons, etc. This removes the necessity of the housewife opening the filter normally built into standard motors, and so eliminates the impression that the Washing Machine is harsh on her laundry. It is strong, sturdy, reliable and easily mounted. There are more than 100,000 pumps in use at the moment.


See that YOU incorporate the best
A.S

KENT electro-ceramics

Low and uniform thermal expansion and adequate resistance to heat shock are factors built-in to every Kent refractory insulator. Special designs or standard requirements, we are well-equipped to meet all demands, and over 80 years' manufacturing experience in the field is another good reason why you can specify Kent—and be sure.

Enquiries on all electro-ceramics are welcome. Write for your copy of our illustrated catalogue.

WILLIAM KENT (Porcelains) LTD
Burslem, Stoke-on-Trent.
Tel.: Stoke-on-Trent 84237/8/9.
Telegrams: "KENELEC," Stoke-on-Trent.

K

BECMA

126 MILLION TIMES SO FAR WITHOUT ATTENTION

BLEECO FLASHERS FOR ZEBRA CROSSINGS ARE AS DURABLE AS ALL THEIR PRODUCTS

– –

LANTERNS
FLOODLIGHTS
BOLLARDS
CONTROL BOXES

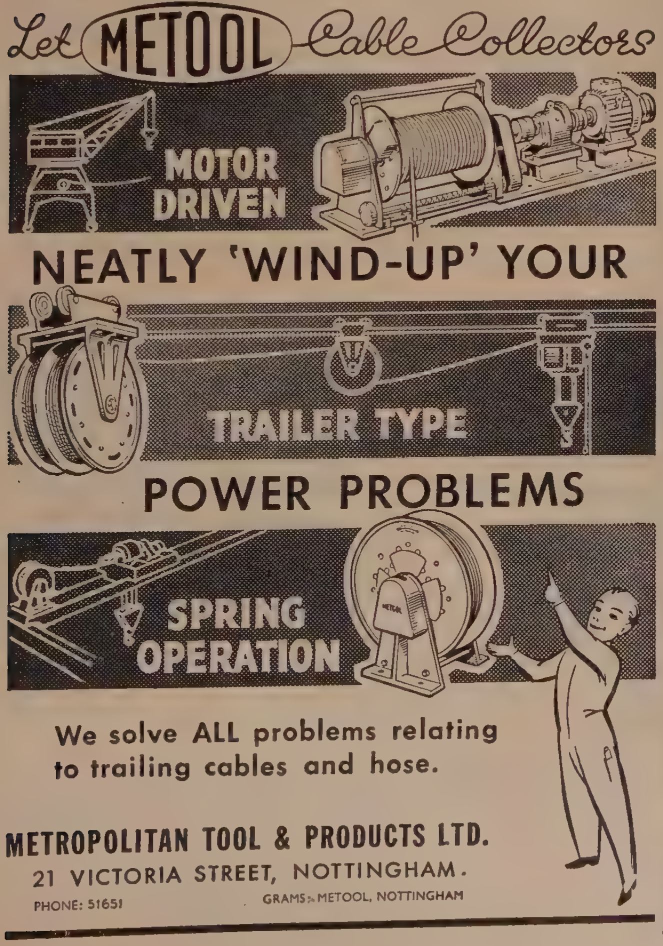
BLEECO LTD
Phone: B/TON 64461
35 WELLINGTON ROAD BRIGHTON 7

PORTABLE TRANSFORMERS

IJD

SIZES AVAILABLE
60·120·250·500·750·1,000 VA
PRIMARY VOLTAGES:
200/250 VOLTS
SECONDARY VOLTAGES
12·25·50·110 VOLTS

JOHN DRUMMOND (ENGINEERS) LTD
BELLCRAG WORKS, Dalsholm Road, GLASGOW N.W. Tel: MARyhill 3315/6



Let METOOL Cable Collectors

MOTOR DRIVEN

NEATLY 'WIND-UP' YOUR

TRAILER TYPE

POWER PROBLEMS

SPRING OPERATION

We solve ALL problems relating to trailing cables and hose.

METROPOLITAN TOOL & PRODUCTS LTD.
21 VICTORIA STREET, NOTTINGHAM.
PHONE: 51651 GRAMS: METOOL, NOTTINGHAM

for Electrical Insulation of every type

VULCANISED FIBRE
LEATHEROID
EBONITE
BAKELITE (Fabric & Paper Base)

The largest and most comprehensive range of insulating materials in the country. Supplied in sheet, rod and tube form.

For any type of electrical insulating material we can usually give ex stock or early delivery. We can offer strip and coil form material cut accurately to size for stamped components. Most grades of insulating material can be offered in this form with quick delivery and competitive prices. Also fabricated parts can be manufactured to suit individual requirements.

Please write or 'phone if further details or samples are required.

Also Turned and Pressed Parts

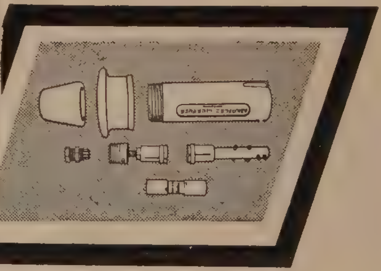
HEAVEN, DOWSETT & Co Ltd.
INSULATION HOUSE, 315 WELLINGTON ROAD
BIRMINGHAM 20
Phone: BIRchfield 6218-9 *Grams:* Fibre B'ham 20

Aeroflex

LINE FUSES

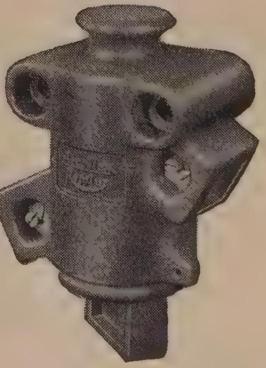
The two types of Line Fuses, differing only in connection, meet a steady demand, for instance, in the protection of pole-mounted transformers. Incorporating Aeroflex AD and FC type rewireable cartridge fuse-links, they have the characteristics necessary to provide discriminatory reaction to faults; e.g. priority can be given to consumers' fuses on house service cut-outs.

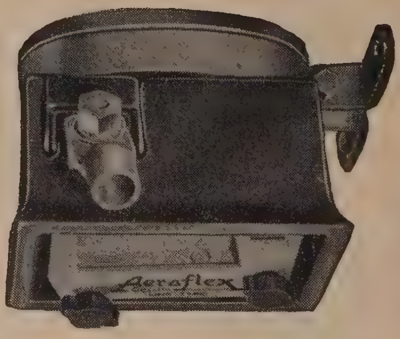
The subject is fully dealt with in our publication No. AL2.



OVERHEAD LINE FUSES

The illustration shows examples from a considerable range of overhead line fuses to suit different situations:—on the left an Aeroflex 60 amp. Rotaloc line fuse is shown, suitable for securing to the cross bar of a line support, and having an adaptable fuse handle carrying an Aeroflex high breaking capacity 60 amp. ADS type rewireable cartridge fuse-link. The right hand illustration shows a 200 amp. porcelain enclosed line fuse, embodying Link Type handle with Aeroflex Ceram high breaking capacity rewireable cartridge fuse-link.





Parmiter Hope & Sugden Ltd.

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

London: 34 Victoria Street, S.W.1. Glasgow: 5 Somerset Place, C.3. Birmingham: 39/41 Carrs Lane, 4.

dmPH142

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words).

DISPLAYED CLASSIFIED:—48/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If displayed with boxed rules, name or symbol block by **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF TWICKENHAM

Street Lighting Improvements, Stage IV

TENDERS are invited for the provision of 200-watt and 140-watt Sodium Vapour and 3 80-watt Fluorescent lighting units on reinforced concrete and steel columns and brackets. Approximately 600 lighting units are involved.

Work "A." Supply and delivery of reinforced concrete columns and brackets.

Work "B." Supply and delivery of steel columns and brackets.

Work "C." Supply and erection of lanterns and control gear and erection only of columns and brackets.

Tenders may be submitted in respect of one or more of the Works "A," "B" and "C" and persons submitting tenders in respect of all three Works may, if they so desire, indicate as provided for in the form of tender, what reduction, if any, they would be prepared to make if their tenders are accepted in respect of all three Works.

Specification, bills of quantities and form of tender may be obtained from the Borough Engineer and Surveyor's Office, York House, Twickenham, Middlesex, on payment of a deposit of two guineas which will be refunded on receipt of a bona fide tender and return of all documents. General conditions of contract may be inspected upon application at the office of the Town Clerk, and plans may be inspected at the office of the Borough Engineer during normal office hours.

Tenders, in envelopes to be supplied, endorsed "Street Lighting Improvements, Stage IV," and bearing no mark indicating the sender, must be delivered to the undersigned not later than 10 a.m. on Friday, the 22nd July, 1960.

The Corporation reserve the right to accept separate tenders in respect of each Work and do not bind themselves to accept the lowest or any tender.

W. H. JONES,
Town Clerk.

Municipal Offices,
York House,
Twickenham.
June, 1960. 5052

CITY OF HEREFORD

Electrical Installation to 102 Traditional Houses and 10 Bungalows Redhill Estate Section Five, Hereford

TENDERS are invited for the wiring for electricity to 102 Traditional Houses and 10 Bungalows on Redhill Estate, Section Five, Hereford.

Plan, specification and form of tender may be obtained from the City Architect, Town Hall, Hereford, upon deposit of £1 1s. (returnable following the submission of a bona fide tender and return of all documents).

Tenders should be returned in the envelope provided and endorsed "Electrical Wiring, 112 Dwellings, Redhill 5," to reach the undersigned not later than 12 noon on Monday, the 11th July, 1960.

T. B. FELTHAM,
Town Clerk.

Town Hall,
Hereford.
June, 1960. 5031

CLASSIFIED ADVERTISEMENTS ARE PREPAID

K

CITY OF HEREFORD

Electrical Installation to 62 Traditional Houses on Newton Farm Estate, Section 4, Hereford

TENDERS are invited for the wiring for electricity to 62 Traditional Houses on Newton Farm Estate, Section 4, Hereford.

Plan, specification and form of tender may be obtained from the City Architect, Town Hall, Hereford, upon deposit of £1 1s. (returnable following the submission of a bona fide tender and return of all documents).

Tenders should be returned in the envelope provided and endorsed "Electrical Wiring, 62 Houses, Newton Farm 4," to reach the undersigned not later than 12 noon on Monday, the 11th day of July, 1960.

T. B. FELTHAM,
Town Clerk.

Town Hall,
Hereford.
June, 1960. 5032

BOROUGH OF MORLEY

Trunk Road Lighting, A.58

TENDERS are invited for the supply, installation and putting into service of 36 totally enclosed 140-w. Sodium street lighting units mounted on 25 ft. concrete columns on the above road.

Forms of tender may be obtained from the Public Lighting Engineer, Town Hall, Morley, and must be returned to the undersigned not later than 9 a.m. on Monday, 18th July, 1960.

E. V. FINNIGAN,
Town Clerk.

Town Hall,
Morley,
Yorkshire. 5053

ELECTRICITY CORPORATION OF NIGERIA

Invitation to Tender

Portable Diesel Alternator Sets

THE Electricity Corporation of Nigeria invites tenders for the supply of:—

2 1,000-kW Portable Diesel Alternator Sets.

Tender documents giving further details of the contract may be obtained from the Resident Engineer, Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2.

Each tender must be enclosed in a sealed envelope marked "Confidential, Tender for 1,000-kW Portable Diesel Alternator Sets," and must be received at the office of the Secretary, Electricity Corporation of Nigeria, 13, Broad Street, Private Mail Bag 2030, Lagos, Nigeria, West Africa, not later than noon on Saturday, 30th July, 1960. Tenders received in any other manner will not be considered.

The Electricity Corporation of Nigeria does not undertake to accept the lowest or any tender.

Further information concerning this contract may be obtained on application to the Resident Engineer.

GEORGE W. NICOL,
Acting Secretary to the Corporation.

5034

CITY OF HEREFORD

Electrical Installation to 105 Traditional Houses Redhill Estate, Section Four, Hereford

TENDERS are invited for the wiring for electricity to 105 Traditional Houses on Redhill Estate, Section 4, Hereford.

Plan, specification and form of tender may be obtained from the City Architect, Town Hall, Hereford, upon deposit of £1 1s. (returnable following the submission of a bona fide tender and return of all documents).

Tenders should be returned in the envelope provided and endorsed "Electrical Wiring, 105 Houses, Redhill 4," to reach the undersigned not later than 12 noon on Monday, the 11th July, 1960.

T. B. FELTHAM,
Town Clerk.

Town Hall,
Hereford.
June, 1960. 5033

ROYAL COUNTY OF BERKSHIRE

Oxford Southern and Western By-Pass

TENDERS are invited for the lighting of the Botley and Woodstock Road roundabouts on the above scheme.

The work consists of the supply and erection of twenty-eight 35 ft. steel columns and lanterns and other works in accordance with the contract documents which may be obtained from the County Surveyor, Shire Hall, Reading, on payment of a deposit of £2 returnable after a bona fide tender has been received.

Tenders to be delivered to the Clerk of the Council not later than the date marked on the envelope enclosed with the contract documents. 5086

COUNTY BOROUGH OF SOUTHAMPTON

invites quotations from Electrical Contractors for electrical installation at new Central Swimming Baths, Southampton, to be sub-contractors to main contractor (R.I.B.A. contract plus supplemental conditions available for inspection).

Forms and particulars from Borough Architect on written application by 8th July, 1960.

Quotation to the Town Clerk, Civic Centre, Southampton, by 12 noon on the 15th August, 1960. 5105

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

ELECTRICAL ENGINEERS

STAFF of the following catagories are required by small but rapidly expanding office of London based Danish Consulting Engineering firm:—

ENGINEERS.
Salary range £1,000/£1,500 per annum.

ASSISTANT ENGINEERS.
Salary range £400/£1,000 per annum.

Experience in the design and specification of electrical services in educational and public buildings is essential for the engineer and membership of the appropriate institutions is desirable, but not essential. Apply:—

STEENSEN, VARMING & MULCAHY
146, New Cavendish Street
London, W.1 5057

Situations Vacant *(continued)*

Central Electricity Generating Board

RESEARCH & DEVELOPMENT DEPARTMENT

ASSISTANT TECHNICAL ADMINISTRATIVE OFFICER

APPLICATIONS are invited from ENGINEERS OR SCIENTISTS for the above post at Headquarters, London, S.E.1.

The successful candidate will be responsible to the Technical Administrative Officer and will be required to study and advise on the administration methods necessary for the correct functioning of a large research organisation including the proper co-ordination of research in related fields and the application of research to Industry and will be required to take responsibility for the inception and supervision of procedures. Having such objects in view, **candidates should have a Degree in Science or Engineering, or evidence of a sound Scientific or Engineering training, together with a high level of education in subjects appertaining to the problems of co-ordinating human endeavour.** They should also be capable of preparing or editing reports incorporating technical matter derived from specialist research reports and be able to deal with general and research policy.

The post would be suitable for a reseach scientist wishing to obtain administrative experience before returning to a senior scientific post or a person who has held a responsible technical post and has an interest in the application of research in modern Industry.

SALARY WITHIN THE RANGE £1,695 - £2,045 P.A.

Applications stating age, qualifications, experience, present position and salary, to the PERSONNEL OFFICER, 24/30, HOLBORN, LONDON, E.C.1, BY 18th JULY. Envelopes should be marked "Confidential Ref. ER/229."

5026

SENIOR DEVELOPMENT ENGINEER

AN experienced contactor development engineer is required, who is capable of producing sound designs in accordance with modern manufacturing techniques.

The company is well established, in an attractive coastal location and the position is a senior one carrying appropriate salary, etc.—Box 5007.

RTB

RICHARD THOMAS & BALDWINS LTD.

Spencer Works, Llanworn
Nr. Newport, Mon.

Vacancies exist for

ASSISTANT ELECTRICAL ENGINEERS

at the Spencer Works

Applicants, who should be between 23 and 45 years of age, should preferably hold a degree, H.N.C. or equivalent qualification in electrical engineering.

The range of specialisation required is not rigid, but applicants should be trained and experienced in development and lay-out work associated with steelworks, rolling mills, or comparable installations in medium or heavy-industry engineering.

Application forms, which should be returned by July 11th, 1960, are obtainable from:—

The Manager,
Staff & Labour Relations Department
Richard Thomas & Baldwins Ltd.
Spencer Works, Llanworn
Nr. Newport, Mon.

5082

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Corporate Membership an advantage.

DEPUTY POWER STATION
SUPERINTENDENT,
WOOLWICH POWER STATION
(Vacancy No. 60/466).

Applicants should be well qualified engineers with some experience of power station administration together with a good record in labour relations. Salary Class H, Grade 3, £1,390-£1,575 per annum.

Applicants to vacancy notice 60/325 issued on 6th May, 1960, need not re-apply.

Applications, quoting vacancy number, to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 12th July, 1960.

5056

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

Second Assistant Engineer

APPLICATIONS are invited for the above appointment in the Area Engineering Department located at Dingwall, Ross-shire.

Applicants should have experience in the construction, operation and maintenance of electricity networks in a predominantly rural area.

The successful applicant will be required to undertake general duties principally in the Planning Department.

Salary scale N.J.B. Grade G, Class 8, £890-£990. Minimum technical qualification, Higher National Certificate in Electrical Engineering.

Superannuation scheme applicable.

Application forms are obtainable from the Area Manager, Church Street, Dingwall, which should be returned by Friday, 29th July, 1960.

5067

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Area Headquarters

WHERSTEAD, IPSWICH
FOURTH ASSISTANT ENGINEER
(Commercial)
Planning, Policy and Development Section
(159/60.R.).

Candidates should preferably have technical qualifications and some practical experience of designing and installing electric space heating and water heating systems. Experience of non-electric heating systems will be an advantage.

The successful applicant will be required to assist the heating engineer with the development of space and water heating techniques, systems and appliances, to prepare technical reports on laboratory and field investigations of installation and running costs and generally to assist with other similar work of the section.

Salary from 1st July, 1960, N.J.B. Grade 11, now Class BX, Schedule B. From 1st July, 1960 to 30th June, 1961, £735/£990.

This appointment should be regarded by candidates as an opportunity to gain valuable experience over a period of about two years which would fit them for promotion to more general commercial posts.

Apply by letter within fourteen days to the Chief Commercial Officer, Eastern Electricity Board, P.O. Box No. 40, Wherstead, Ipswich, Suffolk.

Essex Sub-Area

SOUTHEND DISTRICT
FOURTH ASSISTANT ENGINEER
(160/60.R.).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems including substations.

Salary from 1st July, 1960, N.J.B. Class H, Grade 11 (£800-£875).

Apply by letter within fourteen days, to J. Linton, A.H.W.C., M.I.E.E., A.I.Mech.E., Manager, Southend District, Eastern Electricity Board, 85, London Road, Southend-on-Sea, Essex.

Suffolk Sub-Area

HEADQUARTERS, STOWMARKET
FOURTH ASSISTANT ENGINEER
(Planning and Development Section)
(161/60.R.).

Candidates should have had a sound technical training and will be required mainly to assist in the layout and design of high and low voltage overhead and underground schemes. They should possess the Higher National Certificate in Electrical Engineering or its equivalent.

Salary from 1st July, 1960, N.J.B. Class K, Grade 13 (£800 × £15 to £875).

Apply by letter within ten days to the Secretarial Officer, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket.

5108

MIDDLESEX COUNTY COUNCIL

Education Committee

WILLESDEN TECHNICAL COLLEGE
Denzil Road, Willesden, N.W.10

DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for appointment as LECTURER IN RADIO TECHNOLOGY and ELECTRONICS from 1st September, 1960, or as soon as possible thereafter. Candidates should be able to teach radio technology and industrial electronics to the standard of the Higher National Certificate and I.E.E. Part III examinations. Industrial experience is essential.

Salary within the range (men) £1,408-£1,601 per annum.

Application forms (foolscap s.a.e.) from the Clerk to the Governing Body, 163, Willesden Lane, London, N.W.6, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

C. E. GURR, M.Sc., Ph.D.,
Secretary of the Education Committee.

5088

'ENGLISH ELECTRIC'

(WHETSTONE, Nr. LEICESTER)

offers opportunities to

DESIGNERS AND DRAUGHTSMEN

(Electrical and Mechanical)

in the following fields:

1. **General Mechanical Engineering.**
2. **Plant layout for new project and contract work in connection with conventional power station plant.**
3. **Cabling installation work on machinery and equipment and automatic control circuits.**
4. **Lighting and power system design.**
5. **Preparation of electrical diagrams.**

The appointments are permanent and pensionable and the Company offers modern working conditions and welfare facilities

Enquiries, giving details of age, experience, qualifications and current salary (which will be treated in strictest confidence) should be addressed to the Technical Staff Officer, Dept. G.P.S., Marconi House, 336/7 Strand, London, W.C.2, quoting reference ER 1899L

5065

SOUTHEND WATERWORKS COMPANY

Assistant Engineer (Mechanical and Electrical)

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER (Mechanical and Electrical) at a commencing salary between £1,200 and £1,350 according to age and experience.

Applicants should have a sound training with workshop and drawing office experience and have a professional qualification. Preference will be given to applicants with experience in waterworks pumping installations.

The appointment, which will be terminable by one month's notice on either side, will be subject to a satisfactory medical report, after which the applicant will be required to join the Company's Superannuation Scheme.

The successful candidate will be required to take up his duties not later than 1st October, 1960.

Applications endorsed "Assistant Engineer (Mechanical and Electrical)," stating age, qualifications and experience, and the names and addresses of three persons to whom reference may be made, should be sent to the General Manager, 13, Cambridge Road, Southend-on-Sea, not later than the 6th August, 1960. 5027

COUNTY BOROUGH OF HASTINGS

Hastings and St. Leonards Technical College Archery Road, St. Leonards-on-Sea

APPLICATIONS are invited from persons holding graduate or equivalent qualifications for the Grade B post of TEACHER OF PHYSICS to G.C.E. "O" and "A" level.

Preference will be given to candidates with teaching and industrial experience.

Burnham scale salary: Men, £700 × £27 10s. (15) × £ 37 10s. (1) to £1,150, with additions for degree, training and approved industrial experience; women slightly less until 1st April, 1961.

Application forms from the Principal (s.a.e.), to whom they should be returned by 16th July. 5069

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

Assistant Engineer (Divisional Headquarters)

FOURTH ASSISTANT ENGINEER required in the Electrical Department at Divisional Headquarters.

N.J.B. Agreement conditions. Superannuable appointment, salary within Schedule B, either Grade 9, 10 or 11, according to qualifications and experience. The salary ranges are as follows:—

Grade 9 £840-£1,130 per annum.
Grade 10 £785-£1,055 per annum.
Grade 11 £735-£990 per annum.

Candidates should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification and should have had some experience on equipment associated with E.H.V. transmission.

Apply, quoting Vacancy Number 153/60MD on form AE6 available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, not later than 11th July, 1960. 5055

ELECTRICAL INSULATION

A FIRM with first-class connections in this field and with good production facilities is expanding and will be glad to consider applications from those with a full knowledge of any branch of the trade with a view to creating new sections, under control of successful applicants.

This is a fine opportunity for progressive men who feel that they lack opportunity in their present positions. Good salaries and conditions of service including pension scheme will be offered.

Write in full confidence to Managing Director, Box Z.J.68, Deacons Advertising, 36, Leadenhall St., London, E.C.3. 4943

SOUTH WALES ELECTRICITY BOARD

General Assistant Engineer

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER in the Barry District of the Cardiff and East Central Area of the Board.

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

The salary for the position will be in accordance with Class F, Grade 11 (£710/£755 per annum) of the National Joint Board Schedule for the electricity supply industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, Assoc.I.E.E., Manager, Cardiff and East Central Area, 445/447, Cowbridge Road East, Cardiff, so as to arrive not later than Saturday, 9th July, 1960.

Envelopes should be endorsed "General Assistant Engineer, 130/60."

R. G. WILLIAMS,
Secretary.

5023

ELECTRICAL ENGINEER

required by the SARAWAK ELECTRICITY SUPPLY Co. Ltd. on agreement for one tour of 3 years with prospects of renewal.

Salary according to age, qualifications and experience in scale (including inducement pay) £1,512 rising to £2,009 a year. No income tax at present. Provident fund. Free passages. Quarters provided at reasonable rent. Liberal leave on full salary.

Candidates 30-45 years must be Corporate Members of the I.E.E. or possess recognised equivalent qualifications. They must have served an apprenticeship to electrical engineering and have had subsequent electricity supply experience as a Mains Engineer or Distribution Engineer. Some knowledge of the operation of diesel engine power stations would be an advantage.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/51055/EF. 5024

Situations Vacant (*continued*)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

THIRD ASSISTANT ENGINEER
(System Standardisation).

Applicants should have technical qualifications equivalent to Graduate Membership of the Institution of Electrical Engineers and should have had experience on high voltage electrical distribution systems.

Salary N.J.B. Class M, Grade 10, £1,095/£25/£1,170 per annum.

SENIOR DRAUGHTSMAN
(Electrical).

N.J.B. Schedule D, Grade 5, £790/£890 per annum.

ENGINEERING DRAUGHTSMAN
(Electrical).

N.J.B. Schedule D, Grade 6, £620/£740 per annum.

Applicants should have had experience in the preparation of electrical drawings.

SENIOR DRAUGHTSMAN
(Civil).

N.J.B. Schedule D, Grade 5, £790/£890 per annum.

Applicants should have had experience in the preparation of building drawings.

ENGINEERING DRAUGHTSMAN
(Civil).

N.J.B. Schedule D, Grade 6, £620/£740 per annum.

Applicants should have had experience in the preparation of simple building drawings.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 15th July, 1960.

No. 5 (Wakefield) Sub-Area

BARNSLEY DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have had a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates should have attained the technical standard of the Higher National Certificate in Electrical Engineering or equivalent qualifications.

Candidates must be prepared to reside in the district and undertake standby duties.

Salary N.J.B. Class J, Grade 9, £965 × £20 to £1,025 per annum.

CASTLEFORD DISTRICT

SERVICE CENTRE SUPERVISOR.

Applicants must be thoroughly experienced in service centre work including the sale of electrical appliances, hire purchase procedure, handling of consumers' enquiries, display, and must be capable of advising consumers on any matters relating to electricity in the home. The successful applicant will be responsible for the internal organisation of the service centre and the control of staff including a Demonstrator, Trainee Demonstrator and Trainee Service Centre Assistant. Suitable qualifications will be an advantage.

Salary N.J.C. Grade 5, £885/£25/£960 per annum.

DONCASTER DISTRICT

ASSISTANT CONSUMERS' ENGINEER.

This post offers an opening for a young man with the technical standard of the Ordinary National Certificate in Electrical Engineering who has preferably already had some training in installation work. He will be given training in the various aspects of commercial work in the district, dealing with new and increased supplies to small industrial and commercial consumers, street lighting negotiations and tariff queries. He will initially be required to supervise the Installation Inspectors and to render general assistance to the Consumers' Engineer.

Salary N.J.B. Class H, Grade 13, £710/£15/£755 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 15th July, 1960.

No. 1 (Bradford) Sub-Area

KEIGHLEY DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have passed the Associate Membership Examination of the Institution of Electrical Engineers or hold equivalent qualifications, and have experience in construction, operation and maintenance of high voltage systems, underground cables, overhead lines and substations, and medium low voltage networks.

Candidates should be prepared to reside within the district and undertake standby duties.

Salary N.J.B. Class F, Grade 9, £815/£15/£860 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 15th July, 1960.

No. 6 (Hull) Sub-Area

GOOLE DISTRICT

ASSISTANT CONSUMERS' ENGINEER.

Applicants should have had a good commercial training and have had experience of negotiating with consumers for new and increased supplies and be able to give advice on tariffs and the use of electricity generally to domestic, commercial and small industrial consumers. The duties will also include supervision of service centres and outside sales staff.

Possession of the Ordinary National Certificate in Electrical Engineering or equivalent qualification will be an advantage.

Salary N.J.B. Class F, Grade 9, £815/£15/£860 per annum.

BRIDLINGTON DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER (Commercial).

Applicants should have had a sound practical training in electrical installation work, and have an up-to-date knowledge of the utilisation of electricity on farms. The successful applicant will be required to negotiate with consumers requiring electricity supplies, particularly in rural areas, and deal with estimates for installations, tariffs and sales development generally.

Candidates must hold at least the Ordinary National Certificate in Electrical Engineering or equivalent qualifications.

Salary N.J.B. Class E, Grade 9, £765/£15/£810 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston upon Hull, not later than 15th July, 1960.

Head Office

FOURTH ASSISTANT ENGINEER.

Applications are invited for the position of Fourth Assistant Engineer in the Development Section of the Commercial Department at Head Office.

Applicants should have a Higher National Certificate in Electrical Engineering and some practical training and experience (apprenticeship or otherwise).

Duties will include work on the general applications of electricity including off-peak space heating; interpretation of I.E.E. Wiring Regulations as they apply to general contracting; collecting and collating of information on technical matters; interpretation and/or drawing up of specifications, safety rules, codes of practice, etc., correspondence

Salary N.J.B. Schedule B, Class AX-EX, Grade 8, £735 /£25/£860 rising to £960 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, not later than 15th July, 1960. 5090

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments in the Divisional Electrical Department:—

SENIOR ASSISTANT ENGINEERS
(System Development),
DIVISIONAL HEADQUARTERS
(Cockfosters, N. London) (S.V. No. 1360).

Salary N.J.B. Class AX/DX, Grade 2, £1,475 × £25 to £1,600/£1,705 per annum, plus London weighting.

The successful applicant will be responsible for system design reinforcements entailing the technical and economic appraisal of schemes and the submission of reports.

A knowledge of network analyser practice, symmetrical component analysis, and of the design and layout of high voltage transmission systems would be an advantage. Initiative in system design is essential. Applicants should have had a sound technical training and experience in this type of work and/or in the construction and operation of high voltage transmission systems. They should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications in electrical engineering.

FOURTH ASSISTANT ENGINEER
(Section),
ROMFORD TRANSMISSION SECTION
(Essex) (S.V. No. 1361).

Salary N.J.B. Class AX/DX, Grade 7/8, £735 × £25 to £965/£1,040 per annum, plus London weighting.

The commencing grade and salary will depend upon the qualifications and experience of the successful applicant who will be required to reside within a reasonable distance of Romford, Essex.

Applicants should preferably hold a Corporate or Graduate Membership of the Institution of Electrical Engineers, or equivalent qualification, and have experience in the operation and maintenance of high voltage overhead lines, cables and substation equipment up to 275 kV.

Applications, quoting the appropriate Reference S.V. Number, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 9th July, 1960. 5035

CHEMICO

require

SENIOR ELECTRICAL DRAFTSMEN

with experience of DISTRIBUTION, POWER, LIGHTING and INSTRUMENTATION for heavy industrial applications.

Minimum qualifications H.N.C. and having five years' experience in this type of work. Must be able to work with minimum supervision.

Employment in one of the most modern office blocks in London's West End where excellent working conditions are available with scope for advancement in this American Company.

Please reply by mail giving full particulars to:—

D. Grive, Chief Draftsman

CHEMICAL CONSTRUCTION (G.B.) LIMITED

9 Henrietta Place, London, W.1

(Subsidiary of Chemical Construction Corporation, New York) 5081

SALES AND CONTRACTS ENGINEERS

HEAVY ELECTRICAL PLANT AND RECTIFIERS

'ENGLISH ELECTRIC,' STAFFORD

APPLICATIONS are invited from Electrical Engineers interested in Sales and Contracts work associated with the supply of heavy electrical machines, transformers, rectifiers and their associated control equipment to heavy industry.

The posts are located in technical offices at our Stafford Works dealing with customer liaison, involving correspondence and personal contact as well as the compilation of tenders and estimates.

These openings offer an opportunity to gain valuable experience of up-to-date techniques in the field of heavy industrial applications as well as offering a secure and promising career in a stable industry.

Applicants should possess H.N.C. (E.).

Assistance with accommodation will be discussed at interview.

Membership of the Staff Pension Scheme and eligibility for three weeks' holiday follow qualifying period of service.

If you would like to visit Stafford to discuss these openings please write giving full details to:—

Dept. G.P.S., Marconi House, 336/7, Strand, London, W.C.2
quoting reference ER.1297K.

5029

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and Ministry of Aviation Stations. The work of Station Engineers (G.D.) consists of installation, operation and maintenance of high and medium-voltage electrical distribution systems, electrical power and lighting installations, control systems and generating plant; knowledge of heating and ventilating plant and diesel engines an advantage. Station Engineers (Mech.) are concerned with diesel power plant, steam and hot water heating systems, refrigeration and air conditioning and miscellaneous workshop plant, tools and equipment.

Candidates must hold O.N.C. Elec. or Mech. City and Guilds Electrical Technicians Certificates/ 2nd Class M.O.T. Certificate or equivalent, and must also have had recognised apprenticeship with firm of good repute plus 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference to candidate with supervisory experience.

Salary ranges from £680 to £785 rising by annual increments to £850. Commencing salary dependent upon age, qualifications and experience. Opportunities for promotion up to Tech. Grade A, maximum salary £1,565 (national rate). Pension prospects. 5-day week. 18 days' paid leave a year initially. Internal training courses are provided and attendance at technical colleges by suitable candidates is sponsored. Overseas tours for which special allowances are payable in addition to higher salary.

Applicants, who must be natural-born British subjects, up to age 35, should write stating age, qualifications and experience to Manager (P.E.1), Ministry of Labour, P. & E. Register, Atlantic House, Farringdon Street, London, E.C.4. No original testimonials should be sent. Only applicants selected for interview will be advised. 266

DEMERARA ELECTRIC COMPANY LTD.

Georgetown

A VACANCY occurs for an ASSISTANT ELECTRICAL SUPERINTENDENT, preferably with H.N.C. qualification. The company is expanding and candidates should have good experience of an Undertaking's general work, particularly in respect of distribution, construction and switchgear.

Starting salary about £1,500 per annum.

Please forward full particulars to: Messrs. Mackness & Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1, quoting reference 2481. 4994

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Area Board Headquarters

CHIEF COMMERCIAL OFFICER'S DEPARTMENT, FOURTH ASSISTANT ENGINEER, Commercial and Domestic Section, Carliol House.

Applicants should have experience, and be interested in, all aspects of commercial load development, with particular reference to thermal storage space heating and preferably possess H.N.C. in Electrical Engineering.

Salary Schedule B, Grade 9, Class AX, £840/£1,055. N.J.B. conditions of service.

Tees Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, Darlington.

Salary Schedule A, Class F, Grade 5, £1,010/£1,130. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 5091

INSTRUMENT DESIGNER

ESSO PETROLEUM COMPANY LIMITED invite applications for the post of Instrument Designer at their new Refinery, now nearing completion, at MILFORD HAVEN in PEMBROKESHIRE, SOUTH WEST WALES.

The duties of the successful candidate will include design and drafting of pneumatic and electronic process control installations, preparation of specifications for such installations, and the estimating of costs for various control systems. He will also be responsible for sizing and selecting suitable instruments for control of flow, pressure, liquid level and temperature.

Applicants should have a Higher National Certificate in Electrical or Mechanical Engineering, or an equivalent qualification. Experience of control installations in hazardous areas is also called for.

An attractive commencing salary will be offered to the right man. This will depend on experience, age and qualifications. Membership of a comprehensive pension plan is also available.

Applications giving full details of experience, age, qualifications and present salary will be treated in confidence and should be addressed to:—

The Employee Relations Superintendent
ESSO PETROLEUM COMPANY LIMITED
Esso Refinery
P.O. Box 11
Milford Haven
Pembrokeshire 5094

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments:—

DEPUTY STATION SUPERINTENDENT, CARDIFF POWER STATION
(Vacancy No. 164/ER/60).

Salary F.3 (£1,195 to £1,270 per annum).

Applicants should preferably be Corporate Members of the Institution of Mechanical and/or Electrical Engineers and have had considerable experience in the operation, maintenance and administration of a modern power station.

MAINTENANCE ENGINEER (Mechanical), LLYNFI POWER STATION, BRIDGEND, GLAM.
(Vacancy No. 165/ER/60).

Salary G.6 (£1,025 to £1,085 per annum).

Applicants should have had experience of power station maintenance and should preferably be Corporate Members of the Institution of Mechanical Engineers.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-Fedwen Road, Gabalfa, Cardiff, to be returned by 15th July, 1960. 5106

ASSISTANT DESIGN ENGINEER

(ELECTRICAL)

to undertake in close collaboration with senior engineers design work and preparation of layout drawings for large high-voltage electrical machines and installations.

Applicants should have served a recognised engineering apprenticeship or have had equivalent training, and have had drawing office experience on electrical machines and installations. They should have H.N.C. in electrotechnology and Graduate Membership of the I.E.E. would be an advantage.

SALARY: £930 - £1,340 p.a.

Housing and superannuation schemes.

Send POSTCARD for details to Personnel Manager (1718/48), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks.

4881

Situations Vacant (continued)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Shropshire and Herefordshire Sub-Area

SENIOR ASSISTANT (Education and Training) (Headquarters).

Duties will include the implementation and administration throughout the Sub-Area of the Board's educational and training schemes for all personnel. Applicants should have had experience in the administration of training schemes and in particular craft and student apprenticeships. The possession of an appropriate professional qualification or university degree will be considered an advantage. Salary £885/£960 per annum (N.J.C. Grade 5).

THIRD ASSISTANT DISTRICT ENGINEER (Hereford).

Duties involve the construction, maintenance and operation of H.V. and L.V. overhead and underground mains and substations. Technical qualifications desirable. Salary £800/£875 per annum (N.J.B. Grade F.9).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

South Staffs. and North Worcs. Sub-Area

DISTRICT COMMERCIAL ENGINEER (Stourbridge).

Applicants should have had extensive experience in the industrial and domestic aspects of commercial work, including installations and sales and service to the consumer. Technical qualifications desirable. Salary £1,195/£1,270 per annum (N.J.B. Grade F.3).

THIRD ASSISTANT COMMERCIAL ENGINEER (Headquarters).

Applicants should be well experienced in industrial load development, preparation of specifications and quotations for industrial commercial installations and the planning and supervision of large installations. A good knowledge of modern industrial processes is essential. Salary £1,025/£1,085 per annum (N.J.B. Grade L.10). It is expected that the classification will be raised to "M" with effect from 1st April, 1960.

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Stourbridge).

Applicants should have had experience in the industrial and domestic aspects of commercial work, including installations and sales and service to the consumer. Technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade F.6).

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Brierley Hill).

Applicants should have had experience in the industrial and domestic aspects of commercial work, including installations and sales and service to the consumer. Technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade F.6). It is expected that the classification will be raised to "G" with effect from 1st April, 1960.

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (Smethwick/West Bromwich).

The duties will include estimating for and supervising electrical installation work on consumers' premises. Applicants should have a sound technical training and experience of installation practice. Technical qualifications desirable. Salary £910/£955 per annum (N.J.B. Grade J.10). It is expected that the classification will be raised to "K" with effect from 1st April, 1960.

Apply by letter, within 14 days, quoting ref. SS/T/475, SS/T/478, SS/T/476, SS/T/477, or SS/T/469 respectively, and stating qualifications for the post to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Road, Tipton, Staffs.

Worcester and District Sub-Area

WAYLEAVE OFFICER/SURVEYOR (Redditch/Bromsgrove).

Duties include surveying, profiling, plotting of routes and negotiation and preparation of wayleave agreements, etc. Salary £720/£780 per annum (N.J.C. Grade 3).

Apply by letter, within 14 days, stating age, experience, present position and salary to District Manager, Midlands Electricity Board, Windsor Road, Redditch.

F. W. CATER,
Secretary.

5072

SMITHS AVIATION DIVISION

at CHELTENHAM, GLOS.

require a

DEVELOPMENT ENGINEER

to work on the design and development of miniature precision A.C. motors and synchros for servo-mechanisms.

Applicants should possess a Degree of H.N.C. in Electrical Engineering or equivalent. A good theoretical background and development experience on A.C. machines is required.

Write giving full particulars of age, previous experience, qualifications, present salary and salary envisaged to the

Divisional Personnel Manager

S. SMITH & SONS (ENGLAND) LIMITED
Bishops Cleeve
Nr. Cheltenham, Glos

4929

COMMISSIONING ENGINEER

A COMMISSIONING engineer with H.N.C. must be capable of carrying out full commissioning testing of H.T. and E.H.T. switchgear. Must be fully conversant with primary, secondary, injection testing, pressure testing, also Merz Price, Translay Impedance, etc., testing.

Applications giving full particulars of age, experience, etc., to the Personnel Manager, South Wales Switchgear, Ltd., Blackwood, Mon.

5096

ELECTRICAL DESIGN ENGINEER

A GRADUATE is required for the position of ELECTRICAL DESIGN ENGINEER at this fully integrated Iron and Steel Works situated on the West Coast of Cumberland.

The work is extremely varied ranging from high voltage power to control engineering.

Good life assurance and contributory pension scheme.

Applicants, who should have had practical experience subsequent to a recognised training scheme, should write to the

Secretary
WORKINGTON IRON & STEEL COMPANY
(a Branch of The United Steel Companies Limited)
Moss Bay, Workington, Cumberland

5063

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following position:—

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Contracting), Exeter.

Salary within Class G, Grade 8, £910 × £15 to £955 per annum of the N.J.B. agreement.

The candidate appointed will be responsible to the First Assistant District Commercial Engineer (Consumer Service and Contracting) for electrical installation contracting throughout the District. The duties and responsibilities attached to the post will include the preparation of specifications and estimates for all classes of wiring installations; the preparation of lighting and heating schemes, including heat loss calculations, and the supervision of the larger electrical installation contracts.

Applicants should have had considerable experience of electrical installation work, including the preparation of estimates. The possession of the Higher National Certificate in Electrical Engineering or qualifications leading to it, would be an advantage. The ability to drive a car, and the possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 3, Bedford Street, Exeter. Closing date for receipt of completed applications is Saturday, 16th July, 1960. 5093

AIR MINISTRY

ASSISTANT MECHANICAL and ELECTRICAL ENGINEERS required for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports.

Salary £805 at 25 to £1,095 at 34 or over, thereafter rising to maximum £1,260, with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. 5-day week with 4 weeks 2 days leave a year initially. Special allowance in addition to salary during overseas service.

Qualifications and experience :—

- (i) (a) University Degree or equivalent diploma in electrical and/or mechanical engineering with at least 2 years' apprenticeship; or
  - (b) Graduate or Corporate Member of I.E.E. with at least 3 years' apprenticeship ; or
  - (c) Graduate or Corporate Member of I.Mech.E., appreciable electrical engineering experience with at least 3 years' apprenticeship; and
- (ii) Have been employed for minimum of 2 years with well-established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural-born British subjects between ages of 25 and 45.

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.158/OA. 257

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN, Croydon and Purley District.

Salary £680 × £20 to £740 per annum including London allowance, under N.J.C. Grade 2. Superannuable. Applicants should have a good general education, experience in a distribution drawing office, and be fully conversant with mains recording and preparation of system diagrams, etc. Applications quoting ER and naming two referees, on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 11th July, 1960.

GEORGE WRAY,
Secretary.

5092

Development Engineers

'ENGLISH ELECTRIC'

Stafford

Increasing product development activity gives rise to a number of posts associated with work on the whole range of power plant manufactured at Stafford.

Suitably qualified electrical and mechanical engineers interested in development in one of the following fields are invited to visit the Works to discuss these openings.

LARGE ROTATING MACHINES OF ALL KINDS.
HIGH POWER STUDIES RELATED TO CIRCUIT BREAKERS.
POWER TRANSFORMERS OF THE HIGHEST VOLTAGES AND RATINGS.
INSTRUMENTS AND PROTECTIVE RELAYS.
MERCURY ARC AND SEMI CONDUCTOR RECTIFIERS.
INSULATION MATERIALS AND PROCESSES RELEVANT TO THE FOREGOING.

We are looking for engineers capable of creative work and taking charge of a project on their own.

HOUSING ASSISTANCE will be considered where successful applicants are otherwise unable to settle in the area.

Please write giving full details to

DEPT. G.P.S., MARCONI HOUSE, 336/7 STRAND, LONDON, W.C.2

quoting reference ER 1295L

5028

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

FOURTH ASSISTANT ENGINEERS, TECHNICAL DEPARTMENT (SEC/3.88).

There is a vacancy for a Fourth Assistant Engineer in each of the Technical Areas of the Southern Division. These are at Poole, Portsmouth, Swindon and Reading.

Applicants should have experience of electrical engineering in relation to protective gear including testing and a knowledge of modern switchgear practice is desirable.

Preference will be given to those possessing or studying for qualifications leading to membership of a professional engineering institution or equivalent qualifications.

Salary N.J.B. AX 11, £735-£930.

Special application forms (not A.E.6/ACT) obtainable only from Divisional Secretary, 111, High Street, Portsmouth, should be returned by 13th July, 1960. 5107

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ELECTRICAL ENGINEER, salary rising to a maximum of £1,220 per annum according to age, qualifications and experience, plus £40/£45 p.a. London allowance. Must be A.M.I.E.E. and have had experience in design of large electrical services installations. The successful applicant must be capable of taking charge of works from commencement to final completion.

Applications stating fully age, qualifications, experience and present salary, accompanied by copies of three testimonials, to County Architect, County Hall, Kingston-on-Thames, as soon as possible. 5054

ELECTRICIANS

FULLY qualified electricians required for general maintenance and installation work on large integrated iron and steel works. Excellent conditions; pension scheme in operation.

Apply to The Employment Officer, Appleby-Frodingham Steel Co., Scunthorpe, Lincs. 4891

BIRMINGHAM TAME AND REA DISTRICT DRAINAGE BOARD

ELECTRICAL ASSISTANT, temporary post on the staff of Engineer to the Board, Rookery Park, Erdington, Birmingham, and at a commencing salary within A.P.T. Grade III (£880 × £35 × £40 × £35 (2) × £40 to £1,065). Possibility of housing later. Applicants should have Higher National Certificate in Electrical Engineering or similar qualification and must have drawing office experience in the preparation of specifications, plans, estimates and the installation and maintenance of modern industrial and pumping plant up to 3.3 kV.

Applications, accompanied by names and addresses of three referees and giving particulars of age, qualifications, past and present appointments, experience and when free, should reach the undersigned not later than first post on Monday, 11th July, 1960.

ARTHUR J. WRIGHT,
Clerk to the Board.

Clerk's Office,
Lombard House,
Great Charles Street,
Birmingham, 3.

5085

EASTERN ELECTRICITY BOARD

Area Headquarters

Assistant Apprentice Instructor
(157/60.N)

APPLICATIONS are invited for this post on Area Headquarters Staff but located at the Apprentices' Training Centre at Harold Hill, Romford, Essex.

Candidates should have served a regular apprenticeship in Mechanical Engineering, and have had considerable practical experience. Duties will include instruction of apprentices in basic workshop practice.

Salary N.J.I.C. Schedule E, Grade 2 (£725), plus London allowance, £35.

Apply by letter to the Secretary, Eastern Electricity Board, P.O. Box No. 40, Wherstead, Ipswich, Suffolk, by 16th July, 1960. 5083

EXPERIMENTAL OFFICERS

EXPERIMENTAL OFFICERS and A.E.O's (male) required at ROYAL MILITARY COLLEGE OF SCIENCE, Shrivenham, Berks., as DEMONSTRATORS in Civil, Mechanical and Electrical Engineering, Physics and Metallurgy. Qualifications, G.C.E. (A.L.); Pass Degree; H.N.C. or equivalent.

Salary ranges: E.O. (min. age 27), £954 to £1,166. A.E.O. £382 (age 18) to £830 p.a. Possibility of pensionable posts and promotion.

Quarters available at the College for single men; possibility of housing for married men.

Application forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A289/0A. 5070

LIGHTING ENGINEER/DRAUGHTSMAN

required by leading lighting fittings manufacturer. Capable of preparing interior lighting designs, estimates, surveys, etc. Age 22/28. Salary depending on age and experience. Write—Box 193.

EXPERIMENTAL OFFICERS

EXPERIMENTAL OFFICERS (minimum age 27) and A.E.O's required in WAR OFFICE Establishments mainly in Southern England. Experimental work in CHEMISTRY, PHYSICS, ELECTRONICS, ELECTRICAL and MECHANICAL ENGINEERING and SURVEY COMPUTING. Vacancies in Sevenoaks, Salisbury, Chertsey, Farnborough (Hants.), Feltham, Didcot and S.E. London. Qualifications, G.C.E. (A.L.); Pass Degree; H.N.C. or City and Guilds Final Certificate of grouped course (Adv. Grads.) in Telecomms. For survey computing work, Maths and Geography at G.C.E. "A" is useful.

Salary ranges (male), E.O. £954 to £1,166. A.E.O. £382 (age 18) to £830 p.a. Higher rates in London area. Women's scales the same by 1961. Possibility of pensionable posts and promotions.

Application forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A288/0A. 5071

AN ELECTRICAL MAINTENANCE SUPERVISOR

is required by

TEXACO TRINIDAD, INC.

for service in TRINIDAD

IF you are keen to work in the West Indies, between the ages of 26 and 30, and have the qualifications and experience mentioned below, this vacancy might be an excellent opportunity for you.

You must have the Ordinary National Certificate in Electrical Engineering, be able to drive and have a knowledge of the electrical maintenance and installation of manual and automatic starters, motors, electrical tools, substation switchgear up to 6.6 kV and conduit installation practice. You must also be able to carry out this work yourself should the occasion arise.

TEXACO TRINIDAD, INC., provides accommodation and services at low rentals, schooling for children up to the age of 16, leave passages to and from the U.K. every three years and an excellent pension scheme.

The salary for this position will be in accordance with age and experience but not less than £1,300 p.a.

If you are interested in being considered for this position write in the first instance with brief particulars only to:—

The Personnel Officer, TRINOIL (U.K.) LIMITED
29/30, Old Burlington Street, London, W.1

5025

***Situations Vacant** (continued)*

ELECTRICAL ENGINEER

IF you have a good honours degree in Electrical Engineering, are aged between 26 and 30, and would like to join the Commonwealth's largest glass manufacturing organisation, you are invited to write about yourself to the Personnel Officer (Graduate Recruitment), Pilkington Brothers Limited, St. Helens, Lancashire.

You would take charge of the impulse section of one of the best equipped high voltage insulator laboratories in the country, utilising test voltages of up to 2,000 kV. An extensive programme of research and development relating to toughened glass power line insulators is in progress. You do not require to have had previous experience of this type of work, we will arrange appropriate training. 5022

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

APPLICATIONS are invited for the post of FIRST ASSISTANT DISTRICT ENGINEER in the Lewis District. District office is in Stornoway where the successful candidate is required to operate.

The district is predominately rural embracing the Islands in the Outer Hebrides, and the post provides work of an interesting and varied nature which at times necessitates travel by sea and air.

Applicants should have experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary apparatus. Minimum technical requirements, Ordinary National Certificate in Electrical Engineering. Superannuation scheme applicable. Salary N.J.B. Class C, Grade 5, £860 × £15 to £905.

Application forms for the above posts may be obtained from the Area Manager, Church Street, Dingwall, and should be returned duly completed by Monday, 18th July, 1960. 5036

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Littlebrook Power Station

ASSISTANT ENGINEER (Mechanical Maintenance) (Vacancy No. 100A/60).

Applicants should have had a wide practical experience in modern power station and boiler house maintenance on both coal and oil fired boilers, and should possess H.N.C. or equivalent qualifications. A knowledge of the civil works associated with power stations would be an advantage.

Salary N.J.B. Class L, Grade 11, £1,000 to £1,105 per annum including London allowance.

Applications giving age, details of experience, present position, etc., should be sent to the Station Superintendent, Littlebrook Power Station, Nr. Dartford, Kent, to arrive by 13th July, 1960. 5089

GOVERNMENT OF JAMAICA

Engineer (Refrigeration), Public Works Department

TO design and supervise the construction and maintenance of Government air conditioning and refrigeration installations.

Contract appointment for 3 years. Salary in range £1,050-£1,300 a year. Gratuity 20% of salary. Free passages. Rented quarters.

Candidates up to 50 years must have passed or be exempt from the Associate Membership examination of the Institution of Electrical Engineers or the Institution of Mechanical Engineers, with relevant experience or have equivalent qualification in refrigeration engineering.

Write to Director of Recruitment, Colonial Office, London, S.W.1, giving full names, age, qualifications and experience, quoting BCD.112/32/024/D11. 5087

NORTH WESTERN ELECTRICITY BOARD

Second Assistant District Engineer Bury District

THE duties will include assisting the District Engineer in the construction, operation and maintenance of the 33-kV, 11-kV and low voltage distribution systems.

The successful applicant will be responsible for a section of the District and should be prepared to undertake standby duties.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers.

Salary scale £1,010/£1,130 p.a., Grade H.7, N.J.B. conditions.

Application forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, and to be returned to him by 13th July, 1960. 5066

BRANCH MANAGER

required by Overseas Electrical Contracting Co. for service in Middle East and surrounding territories.

Applicants, preferably aged between 30 and 40, with previous experience of a similar position in U.K., should apply in writing with full details of their careers. This is a senior appointment and only applicants with considerable experience in all aspects of contracting from enquiry to final account can be considered.

Total emoluments will be in the region of £4,000 and a company car will be provided. Quote ref. OCM2.

Box 5059.

ASSISTANT ELECTRICAL ENGINEERS

SENIOR and INTERMEDIATE GRADES are invited to apply for vacancies in an expanding department of Consulting Engineers' London Office, for work on industrial and commercial projects comprising the design, specification and estimates for power distribution schemes, electrical installations within buildings, heating, lighting and power.

Applicants should have served an apprenticeship or equivalent practical training together with experience in this work and must hold National Certificate or equal qualifications.

Applicants should send in confidence, education, training, age and experience to:—

FREDERICK S. SNOW & PARTNERS
Electrical Section
144, Southwark Street
London, S.E.1 5095

J. LYONS & CO. LTD.

ICE CREAM DIVISION

require

ELECTRICAL DRAUGHTSMEN

who must have qualifications up to H.N.C. standard and some practical experience of installation work, H.V. and L.V. distribution, modern control gear, electronics and process control methods.

Please write stating age, qualifications and experience to The Personnel Manager, Works Department, J. Lyons & Co. Ltd., 143 Hammersmith Road, London, W.14.

5080

DRAUGHTSMEN REQUIRED BY LIGHTING EQUIPMENT MANUFACTURER

A GOOD opportunity for young draughtsmen arises in the London office of a well-known and established manufacturer of a variety of specialised lighting fittings. Some works experience or training preferred.

Convenient to Victoria and Waterloo stations. 5-day week, contributory pension scheme.

Write fully to—Box 5004.

SHIFT FOREMAN

required by the UNITED KINGDOM ATOMIC ENERGY AUTHORITY at Dounreay Experimental Reactor Establishment, Thurso, Caithness, to be responsible, on shift, for the maintenance and operation of electrical plant and equipment.

Applicants must have served a recognised engineering apprenticeship and have experience in the control of industrial labour. Experience of permit-to-work systems and switchgear operation is desirable. Possession of an appropriate O.N.C., or equivalent, may be an advantage.

Salary on scale between £925 (at age 30 or over) and £1,105.

Contributory superannuation. Staff housing scheme.

Hostel accommodation available.

Send POSTCARD for application form, quoting reference 291/J7, to Personnel Manager at above address. 5021

Mobil Oil Company Limited

invites applications for the position of

SHIFT CHARGE ENGINEER

AT ITS REFINERY IN ESSEX

The Power Station consists of three oil and gas fired I.C.L. boilers operating at 650 p.s.i.g., 750°F. m.c.r., each 180,000 pounds per hour and three 5,000 kW Metro Vickers double extraction condensing turbo alternators extracting at 125 and 20 p.s.i.g. generating at 11 kV, 3 phase, 50 cycles. Allied to this there is water softening equipment consisting of hot lime pretreatment, hot zeolite finishing of 500,000 pounds per hour capacity with miscellaneous auxiliary equipment. Modern housing may be made available to the successful applicant. Excellent conditions of employment.

Applications should be addressed to the

EMPLOYEE RELATIONS SUPERINTENDENT
MOBIL OIL COMPANY LIMITED
CORYTON REFINERY, STANFORD-LE-HOPE, ESSEX 5074

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

ELECTRICAL ENGINEER ASSISTANT

The Overseas Engineering Department of the Dunlop Rubber Company Limited requires an electrical engineer assistant to work in their Birmingham Office on A.C. and D.C. motor control schemes and on H.T. and L.T. distribution layouts. The work also includes corresponding with overseas factories on general electrical queries. Applicants should possess a Higher National Certificate (Electrical) and have had suitable experience. Age range: 25-40. An attractive salary will be paid to the person appointed. Pension scheme; excellent working conditions. Holiday arrangements respected. Confidential applications, giving qualifications, experience and salary requirements, should be addressed to:—

Staff Officer (OE), Employment Department
Fort Dunlop, Erdington, Birmingham 24

5064

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

SECOND ASSISTANT STATION CHEMIST,
PORTSMOUTH GENERATING STATION (SEC/3.87/R).

Applicants should have had practical experience of fuel, water and oil testing appropriate to a generating station. A knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage.

Preference will be given to candidates with H.N.C. in chemistry or equivalent qualifications.

Salary N.J.B. H.11, £800-£875.

Special application forms obtainable only from Divisional Secretary, 111, High Street, Portsmouth, should be returned by 12th July, 1960. Please quote reference number. 5084

HUDSWELL, CLARKE & CO., LTD.

AN ELECTRICAL ENGINEER is urgently required to fill a vacancy in the electrical department of this old-established firm.

The work involved would deal with the design and utilisation of electrical equipment for a large variety of specialised mechanical machinery.

Applicants should possess H.N.C. Electrical (or equivalent qualifications) and have experience in the design and installation of control schemes and instrumentation.

Please apply in writing, giving age and a brief outline of career to date to:

The Chief Designer
HUDSWELL, CLARKE & CO. LTD.
Olympia Works
Roundhay Road
Leeds, 8.

5005

LONDON ELECTRICITY BOARD

Assistant Distribution Engineer

APPLICATIONS are invited for the above position in the Board's North Eastern District at Church Hill, Walthamstow, London, E.17.

Applicants should have had a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class G, Grade 11, £805 per annum rising to £860 per annum, inclusive of London area allowance.

Write for application form to Personnel Officer, 46, New Broad Street, London, E.C.2, quoting reference PER/V/3001/R. 5068

OVERSEAS CONTRACTS ENGINEER

A VACANCY exists for an experienced Electrical Engineer to take charge of installation and commissioning of cables, overhead lines, switchgear and transformers with associated administrative work. Previous supervisory experience essential. The work would be located in Nigeria and Ghana, the initial period of this tour being 18 months.

Applications giving full particulars of age, training and experience to:—

Employment Manager
JOHNSON AND PHILLIPS LIMITED
Victoria Way, Charlton, London, S.E.7

4971

BICC

ENGINEERS

required for the erection of steel tower and wood pole overhead transmission lines at home and overseas. Applicants should have a general engineering background up to O.N.C. level. Experience desirable but not essential. Permanent position including pension fund membership after satisfactory probation.

Applications giving full details of experience, age and qualifications to the

Staff Officer
BRITISH INSULATED CALLENDER'S CONSTRUCTION COMPANY LIMITED
30, Leicester Square
London, W.C.2

4990

DESIGNER

OTTERMILL SWITCHGEAR have a vacancy for a qualified engineer to act as deputy to the Chief Designer. The position is one of responsibility, and requires an experienced man who is prepared to devote his ability to the further advancement of the Company's expansion in the medium voltage switchgear field.

Good salary and prospects with a Company near the South Devon coast. There is a non-contributory pension scheme, and assistance with housing accommodation will be available if required.

Apply, giving full details of qualifications and experience, to the Chief Designer, Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 5058

TECHNICIANS

with electrical experience required to work in Lighting Laboratory Model Shop. Knowledge of amplifiers an advantage. Age about 24, although older men would be considered. Salary according to age and experience; 5-day week of 38½ hrs.

Apply quoting Ref. No. J8566 to:—

PERSONNEL MANAGER
THORN ELECTRICAL
INDUSTRIES LTD.
GREAT CAMBRIDGE ROAD
ENFIELD, MIDDX.

5075

A LARGE British concern established in East Africa requires an air conditioning engineer to play a leading part in the development of a rapidly expanding business, preferably coupled with a knowledge of American equipment. A generous starting salary is offered which, together with attractive terms and allowances and good prospects for advancement, make this position a good opening for a man with ambition. Full details in confidence to—Box 5038.

AIR conditioning and refrigeration applications engineer required for work in tropical West Africa by a leading British concern. Successful applicant will have wide scope for designing and selling complete installations in an expanding market using both British and American equipment. Good experience in this field is essential. A starting salary from £1,500 per annum according to qualifications and experience is offered with free accommodation, generous conditions of service and regular home leave. Apply with full particulars to—Box 5039.

B.B.C. requires engineer in planning and installation department, London, initially to undertake work on power installations for transmitter and studio premises. Preference given to applicants capable of extending their field of activity to installation, testing and commissioning of radio frequency equipment. Opportunities to gain necessary experience. Applicants must be British subjects preferably holding qualifications recognised for Graduate Membership of I.E.E. and should have had site installation practice and practical experience in manufacturer's works. Specific experience of diesel alternator installations desirable but not essential. Salary in scale £1,230 to £1,580 p.a. commensurate with qualifications and experience. Requests for application forms to—Engineering Recruitment Officer, Broadcasting House, London, W.1, quoting ref. 60.E.91.E.R. 5060

BRANCH manager required by leading electrical contractors for West Midlands branch. Applicant must have current experience of, or be holding, a similar position. Remuneration to match experience. Replies in confidence stating all particulars to—Box 4973.

CABLE estimators required by Hackbridge Cable Co. Ltd., Hackbridge, Surrey. Must be fully conversant with estimating for paper, rubber and thermoplastic cables; pensionable post. Write stating age, experience and salary required. For the attention of the Sales Manager. 5097

CONTACTOR application and motor control centre design engineer required for expanding company. Good working conditions in modern factory. Own staff aware of this advertisement. Assistance given with housing. Apply to—Box 5040.

CONTROL circuit engineer and estimator for automatic motor control gear; O.N.C. or H.N.C. desirable with previous experience; permanent and pensionable situation. Apply giving details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 129

CRATER PRODUCTS Ltd., manufacturers of rotary switches, wish to appoint a number of representatives. Good connections are essential and will qualify for generous remuneration and expenses. Apply—Crater Products Ltd., Knaphill, Woking (Brookwood 2571). 4974

DESIGN draughtsman, capable of taking off own quantities.—London (REL. 5874). 5061

Situations Vacant (continued)

CROMPTON PARKINSON (CHELMSFORD) Limited invite applications for appointments in the machine department, estimating section, at their Chelmsford works. Applicants should have had a sound technical training and some experience in handling enquiries for A.C. and D.C. rotating plant and control gear up to 1,500 h.p./kW capacity. Congenial working conditions with excellent opportunities for advancement. 5-day week. Superannuation scheme. Apply in confidence stating age, whether married or single, with details of experience and training to Personnel Officer, Crompton Parkinson (Chelmsford) Limited, Chelmsford. 5037

DESPATCH and pricing clerk, senior grade, required by old-established business in the lighting trade. Knowledge of this trade a considerable advantage. This is a well-paid permanent position with prospects. Reply stating age and experience to—Box 4948.

DRAUGHTSMAN (junior) electro/mechanical; interesting situation with excellent prospects. Apply giving full details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 130

EAGLE STAR INSURANCE Company Limited requires an electrical surveyor for the London area. Permanent position on progressive salary scale £800-£1,100, with non-contributory pension and contributory widows' pension. Candidates aged 27-33, with H.N.C. or equivalent, experienced in A.C. or D.C. armature winding, power installations including testing and fault finding, should apply, stating age, qualifications and experience, to—Acting Chief Engineer, 15/25, Ewell Road, Cheam, Surrey. 5041

ELECTRIC motor repairs, small shop London district; capable man required, fully experienced domestic and fractional h.p. motors, to assist in re-organising neglected business. Salary and share of profits.—Box 5098.

ELECTRICAL contractors require young estimator with experience of industrial and commercial installation work. The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers Street, Wolverhampton. 5009

ELECTRICAL engineer required for Glasgow office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2. 5051

ELECTRICAL engineering assistant required to assist in preparing specifications for H.V. and M.V. plant, including switchgear, transformers and cabling, and/or general electrical installations in buildings. For those obtaining H.N.C. (elec.), prospects of advancement in entry grade to £1,250. Pension scheme. Staff restaurant. One Saturday only in every five. Form from Chief Engineer (GS/ER/1656/7), L.C.C., County Hall, London, S.E.1. 5042

ELECTRICIANS and mates required. Write or phone—Harris & Sheldon Ltd., Thane Villas, Seven Sisters Road, London, N.7 (North 2475). 5043

ENGINEERS for inspection of cranes and lifting plant. Must have drawing office experience of design of cranes, also National Certificate in Mechanical Engineering. Essex, Warwickshire and Liverpool areas. Starting salary £800 per annum. Non-contributory pension; permanent. Apply — Engineering Dept., General Assurance Corp. Ltd., Aldwych, London, W.C.2. 5030

EXPANDING firm of consulting engineers, with international reputation, require intelligent electrical engineer/draughtsman, aged 19 to 25, to assist senior electrical engineers in the design and supervision of electrical installations in buildings of all types. Ideal situation for a man having recently completed his apprenticeship. Proved ability would result in greater responsibilities leading toward a position as a senior electrical engineer. Write—Steensen, Varming & Mulcahy, 146, New Cavendish Street, London, W.1. 4889

MAGNETIC amplifiers. Engineers required to design and develop magnetic amplifiers for various control applications. Some experience in this field is essential. Apply to Haddon Transformers Ltd., Victoria Park Industrial Estate, Field End Rd., Ruislip, Middx. 4890

GRADUATE engineer. If you have a good honours degree in mechanical or electrical engineering and are about to complete your post graduate apprenticeship and would like to make a career with the Commonwealth's largest glass manufacturing organisation, you are invited to write about yourself to the Personnel Officer (Graduate Recruitment), Pilkington Brothers Limited, St. Helens, Lancashire. Initially you would be a technical assistant in the production department of the works manufacturing toughened glass doors, wall cladding and many other forms of toughened glass. After training in production methods you would be engaged particularly on method development. You would have ample scope for exercising your initiative and later you would have opportunities for promotion in maintenance engineering or production departments, in this country or overseas. 5076

QUALIFIED technical assistant, 22/25 years of age, with H.N.C. electrical and preferably some experience of motors and switchgear. Required in sales office of small progressive manufacturers in Home Counties to assist in handling orders for specialised equipment used in electricity generation, distribution and industry at home and overseas. High salary for outstanding ability.—Box 5044.

REQUIRED for Malaya, assistant electrical engineers, preferably single, age 25-35; Higher National Certificate. Sound practical knowledge electrical plant and switchgear to supervise sales and installation work. Attractive salary and other benefits. Write—Box Z.S.243, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3. 5077

SALES engineers. Young engineers over 21 years required for indoor staff of sales department. Technical and works training in electrical engineering practice, at least to O.N.C. standard, is required by West London engineering company specialising in explosion-proof and industrial electrical control gear as well as other electrical equipment for industry. Candidates, in replying, should state age, training, qualifications and anticipated remuneration, in confidence, to—Box 182.

SALES representative (young) required by manufacturers of wiring accessories, etc., to take over established connection. Greater London area. Knowledge of trade essential. Small car provided. Write full details—Box 4976.

SALES representatives required for the London area. We have two vacancies for representatives to operate in the London and adjacent areas. Experience in switchgear, transformers and their application desirable. Applications stating age, experience and salary required, should be addressed to—South Wales Switchgear, Ltd., 19, Woburn Place, London, W.C.1, marked "Representative." 5099

SENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, spring and summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 185

SENIOR transformer draughtsman required with experience up to 20 MVA. Applications giving age, experience, education and salary required to—Box 5045.

SERVICE engineer required for electro-mechanical equipment. Lift experience a definite advantage. Must be prepared to travel. Staff appointment. Pension fund. Apply in writing stating age, experience, salary required, etc., to Personnel Officer, Dewhurst & Partner, Ltd., Inverness Road, Hounslow. 5011

TELEPHONE maintenance engineers required for servicing automatic and manual installations in the Cardiff and Newport area. Permanent position with pension. Write full details age, experience to Reliance Telephone Co. Ltd., 18, Lawford St., Bristol, 2. 4964

TRANSFORMER draughtsmen who want to widen their experience will find interesting and varied work at Foster Transformers Limited. In particular, a draughtsman is required in the high voltage transformer section, dealing with test transformers up to 500 kV and two draughtsmen are required in the section dealing with control cubicle design. Apply stating age, experience and salary required to the Personnel Officer, Foster Transformers Ltd., South Wimbledon, London, S.W.19. 5078

SPECIFICATION writer/engineer. A vacancy exists with Sangamo-Weston Ltd. at Enfield for a young man having a light electrical engineering background and preferably educated to H.N.C. standard, although candidates having an O.N.C. and continuing their studies will be considered. Work entails preparation of specifications of electrical measuring instruments to meet customers' requirements and liaison between development laboratories and contracts department. Write giving full details of experience, etc., to the Personnel Manager, Sangamo Weston Ltd., Cambridge Rd., Enfield, Middlesex. 4950

TROUGHTON & YOUNG (LIGHTING) Ltd., have a vacancy for an assistant lighting engineer with some experience in the planning of commercial lighting installations. Ability to deal with customers at all levels. Age 24/28. Full details to—Technical Director, 143, Knightsbridge, London, S.W.1. 5046

YOUNG man, with first-class experience in the lighting trade, required to take up interesting position in connection with distribution and stores control, in old-established business. Reply stating age, salary required and experience to—Box 4949.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

BUYER, order pricing experience with large contractors and wholesalers (39), seeks position.—Box 7567.

ELEC. eng. (39), exp. home/overseas, mining/electronics/winding, bilingual, Port., some Span., seeks post. References.—Box 7562.

EST.-SUP.-ENGR., elec. contracting, exp. enquiry to final acct., desires progressive post, Sussex/Surrey/London.—Box 7566.

SALES liaison engineer with good knowledge of cable, lighting, distribution, radio and telecommunications equipment, possessing established connections with E.E. Board, industry and municipalities in East Anglia, desires to join firm wishing to improve their technical representation.—Box 7552.

SENIOR sales representative (38) seeks advancement. Wide experience and contacts with Government departments, nationalised industries, large users, etc.—Box 7558.

ARTICLES FOR SALE

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Sale by Tender of Two Rotary Convertors

THE Board have for disposal and invite tenders for the purchase of two 500-kW, 6,600-v./460-v./230-v., 3-wire D.C. rotary convertors, recently withdrawn from service, with transformers and starting panels.

Particulars as to where they may be inspected and Forms of Tender, on which offers must be submitted, may be obtained on application to the Manager, No. 4 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, Wrexham. Tenders must be returned in a sealed envelope, as provided, so as to arrive not later than Noon on Wednesday, 13th July, 1960.

The equipment is offered for sale without guarantee as to its condition, and the Board do not bind themselves to accept the highest or any tender and reserve the right to accept the whole or any part of any tender.

M. M. PARKER,
Secretary.
5100

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

600

WARD LEONARD SETS

All incorporating motor generator sets comprising slipring motors normally 1,440 or 960 r.p.m., with direct coupled generators and excitation equipment, together with A.C. and D.C. control gear.

TYPICAL WORK MOTORS

H.P.	Maker	Voltage	Speed
0/340	E.E.C.	0/480	0/1500
0/200	W'HSE U.S.A.	0/230	0/1750
0/160	CROM.PARK.	0/480	0/1000
0/150	MET. VICK.	0/500	0/1500
0/130/150	M. & PLATT	0/500	0/360/500
0/120/120	G.E.C.	0/220	0/750/960
0/95	ALLEN	0/220	0/1300
0/60/60	ALLEN	0/230	0/1300/1500
0/60/60	E.E.C.	0/500	0/2000/2900
0/33/33	MAWDSLEY	0/290	0/1050/1500
0/24/24	E.E.C.	0/110	0/1450/1800

Others available down to 3 h.p. Wide choice of speeds all covered by guarantee.

GEORGE COHEN
Sons & Co. Ltd.
Wood Lane, London, W.12
(Shepherds Bush 2070)
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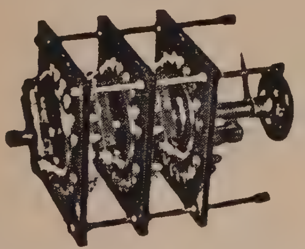

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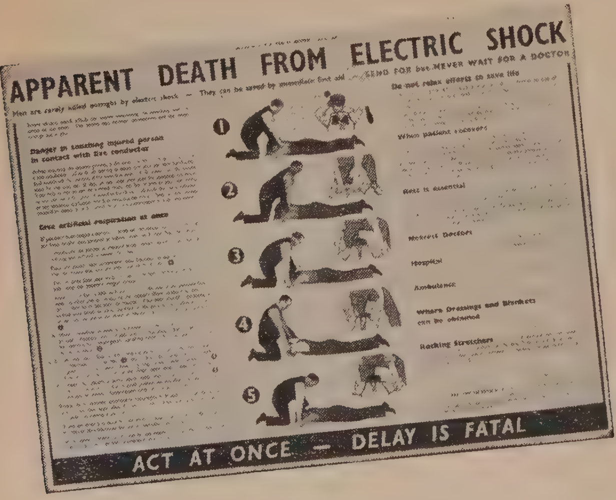
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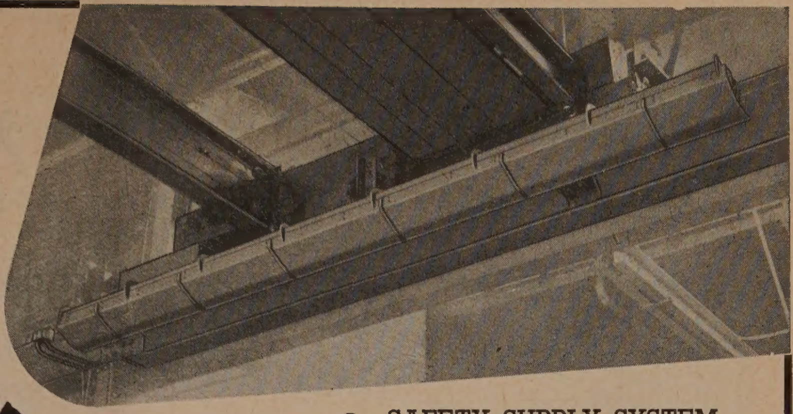

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(Prov. Patent No. 31568/58)

PRINCIPLE

The principle of Manguard is the provision of a set of flexible bar collectors on the crane and electrically protected contact boxes at intervals along the crane track connected by insulated cable.

SAFETY FEATURES

- Contact box spacing ensures an electrical supply to the crane at all times.
- Each contact box has its own contactor ensuring that the contact studs are alive only when in contact with the crane collector bars.
- The crane collector box is fabricated in fibreglass. The four contact bars are bedded in flexible polyurethane, giving long life and minimum maintenance.
- Isolation of any section may be readily carried out.
- MANGUARD equipment may be fitted to existing cranes.

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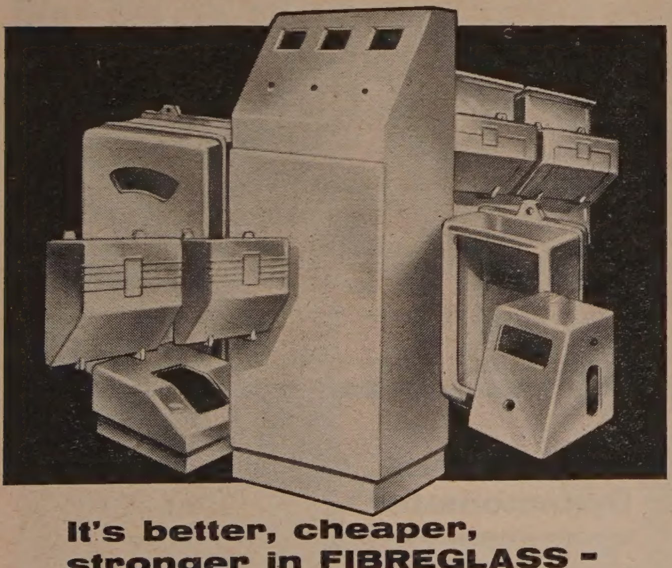

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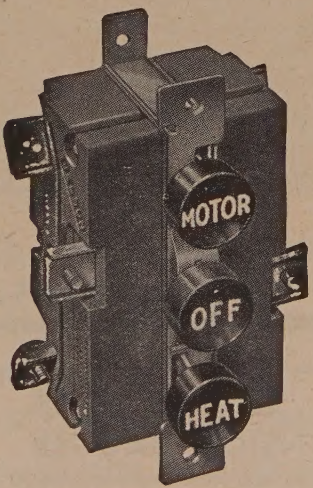

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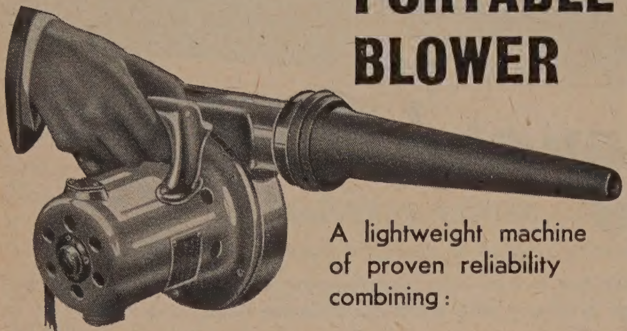

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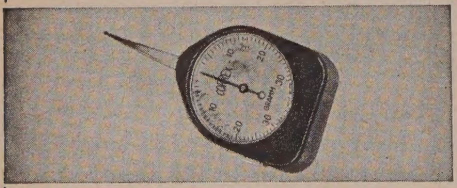

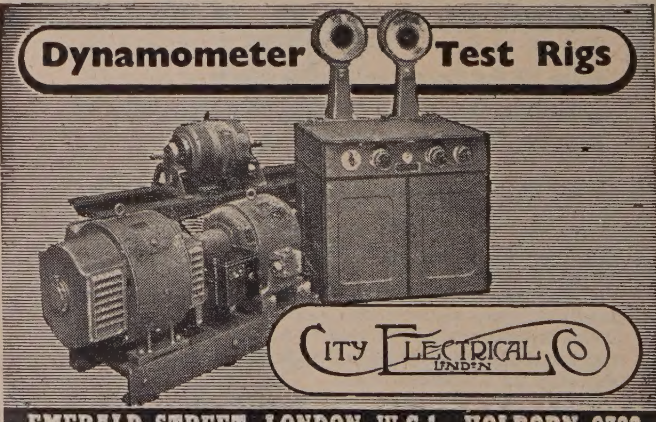

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And robes the mountain in its azure hue.
(Pleasures of Hope by Thomas Campbell)

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